Appendix 1-2: Peer-Review Panel Comments on the Draft *2011 South Florida Environmental Report – Volume I*

In September 2010, these comments of the peer-review panel were provided publicly on the District's SFER WebBoard (www.sfwmd.gov/webboards). The information was prepared under Purchase Order to the South Florida Water Management District. With the exception of reformatting some information for better readability, this appendix was not edited or spellchecked by the SFER production staff and appears verbatim as posted on the WebBoard.

PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2011 SFER – VOLUME I, CHAPTER 2

Level of Panel Review: Accountability (primary); Integrative (secondary)
Reviewers: V. Singh (AA), O. Stein (A), V. Novotny (A)

Posted: 09/14/10 at 07:23 PM by O. Stein

The review is divided in to several sections. First are several broad questions and comments regarding the interpretation of reported results followed by relatively minor questions about specific sections/sentences phrases etc. This is followed by comments on figures and tables and lastly, editorial suggestions.

Broad comments questions and comments that should be addressed:

This chapter on Hydrology continues to be a one of the most fundamental of the SFER reports as it is the management of water that is the District's primary mission, and it is the presence and movement of that water that influences water quality and ecological resources throughout the District's jurisdiction. However, unless there is promulgation of new priorities and/or a new set management decisions, it is fair to say the chapter is concerned primarily with the reporting of the data and how current management decisions were made in response to that data. Therefore the Accountability review level is very appropriate.

The authors have made a several changes in response to last year's panel's recommendations. Most notable is the inclusion of new Figures 2-25 and 2-25 which provides a nice overview of how decisions are made for the movement of water from Lake Okeechobee to meet various competing needs, while maintaining the Lake's water level within management goals. These figures are welcome additions to the Report.

The panel also acknowledges the inclusion of new lines 60-73, instructing the readers as to locations of other hydrological aspects of the District's plan. However, as noted in the final comments to last year's draft, the panel believes that an introductory section describing how the District attempts to balance the often conflicting goals and needs of water users within South Florida is a missing component to the document. Many of these goals and needs are listed at various times, but the document would benefit from a listing these in once location in some logical manner. For example, a reader can learn that water is moved through the St Lucie Canal for various purposes (estuary ecological health, minimization of groundwater salt intrusion, navigation, perhaps (direct water use?), and flood control. These uses must be balanced for similar uses in the Caloosahatchee River basin, the STAs, WCAs and ENP and municipalities south of the STAs, as well as maintaining acceptable lake levels. This is obviously a highly complex system, and the district generally does an exemplary job of management, but it seems the goals of the management, despite the inclusion of Figures 2-24 and 2-25 are not clearly articulated anywhere. Articulation of these goals should be a permanent component of the "Introduction" section.

The panel notes that much of the District's hydrological analysis of data, this year the correlation between El Nino and La Nina years, is of high caliber as evidenced by the results being published in refereed journals.

Please include all acronyms in the introductory section to the Report that contain may others

Specific Questions by page and line.

Lines 594-596 The text on these lines contradicts itself and the data shown in Fig 2-16. The figure shows below average Nov- Jan and above Feb-April.

Lines 709-711. The significance of these statements is not clear and a little more information is warranted. One could assume all 16 named storms impacted South Florida in WY 2009, but I do not believe that was the case. This small confusion can be avoided by consistency in reporting of the data from year the year.

Figure and Table comments:

Table 2-5 The years are ranked by the strength of the event but the way the table is organized it is not clear if one should move across row first then columns or visa versa.

Figure 2-9 The scale appears to be radar intensity. This should be converted to a depth of rainfall.

Figure2-17 The first symbol on the solid line appears to be wrong and the significance of the small lines protruding from the open symbols is not defined.

Figure 2-22 The lines are not properly shown in the legend, therefore it is not clear which line represents what variable.

There is some confusion, or at least redundancy, between Figures 2-18, 2-22b and 2-23. Perhaps it is because the data on Fig 2-18 overlaps two different management schedules but 2-18 is very hard to decipher. The actual data from WY 2010 is repeated in 2-22b, I assume for consistency between other panels of that figure. Finally, it seems that it would be more logical to present the lines in Figure 2-23 (which are in both of the preceding figures) on a water year as done in the previous figures rather than calendar year. Presentation would at least be consistent that way.

Editorial comments by line number

Line 27:
the average rainfall- the summer had average rainfall, and October and November were drier than

Lines332-333
Table 2-4 depicts average stage ~~for WY2010~~, surface area, ~~average~~ and storage for each major water body in WY2010, as well as storage at end of WY2009~~, storage at the end of~~ and WY2010, and change in storage between those years.

Line 461
Comparison of the annual rainfall deviations relationship to strong ENSO events demonstrates

Lines 527-540
El Niño-related dry season rainfall is associated with cold fronts coming from the north and northwest. There were six major rainfall events with large amounts of rainfall; two in December 2009 (Dec. 2–6 and Dec. 15–19), two in March 2010 (March 11–13 and March 28–30) and two in April 2010 (April 11–14 and April 26–27). Generally, an El Niño event impact on rainfall is highest in the northern part of the District because the fronts usually come through that area. **Figure 2-9** depicts a frontal rainfall passing from north to south of the District on March 29,

2010. In cases where the front blows through at a faster speed and slows in the south or retreats back, the southern half of the District gets more rainfall. In WY2010, there were fronts that moved fast through the northern half of the District and slowed down in the south. **Table 2-8**, **Table 2-9**, and **Table 2-10** show for each major frontal rainfall event total rain catches over each rainfall area and a single day maximum rainfall at a site ~~for each major frontal rainfall event~~. **Figure 2-10** depicts total rainfall from the six major frontal rainfall events. WY2010 monthly rainfall complete data and analysis are presented in the *Water Year 2010 Hydrology* section of this chapter.

A ~~C~~characteristic of frontal rainfall is that the coverage area is large and the total volume of

Line 814
since 1982 when data ~~are~~first became available. **Figure 2-19** depicts number of acres burned in a water year

Posted: 09/17/10 at 10:44 AM by V. Novotny

Accountability Review

Vladimir Novotny

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

1. On many pages of Chapter 2, starting with page 2-19, the authors advance the hypothesis that rainfall and flow patterns as well as water level fluctuations are tied to El Niño Southern Oscillation (ENSO) and La Niña Pacific Ocean warming and cooling. While these hypotheses have been discussed in media and hydrological literature they authors of the chapter did not reference a single peer review article with an exception of their own agency reports. One would expect that if such linkages are true and have such effects on the weather and hydrology of South Florida there should be somewhere peer review papers that would prove it. While in the chapter authors' correlations seem to be interesting and to some degree persuasive, without peer review publishing in hydrological and meteorological scientific papers there may be some who would classify them as speculative, especially when it is very difficult to predict ENSO and most of its impact is apparently felt in cold weather and the entire South Florida water management system is heavily manipulated. If authors have such literature references they should be included. There are many articles on this topic in the literature and some of them can be pertinent to South Florida.

2. Table 2-1 shows the flows in 2009 and 2010. 2010 is not finished. The table should report partiality of the 2010 (first 6 months?) otherwise a reader at the end of the year would be wondering why the flows were so low in a "wet" year. Apparently, WY 2010 is not a calendar year but this was not clearly stated in the Chapter and throughout the report.

3. Figure 2-7 show the "proof" of the ENSO effect on Lake Okeechobee. However, this lake is highly managed; therefore, one has to distinguish what fluctuations are due to lake management and which ones are attributed to ENSO.

4. Table 2-6. Metric conversions of ac-ft and other US dimensions should be included.

5. Line 170, p. 2-6 – Define "standard project flood". Many readers do not know that this is an "ultra catastrophic" flood. The word "standard" is somewhat misleading and saying that the flood protection is meeting only 30 – 40 % of a "standard" flood is misleading.

6. Lines 348 + on pages 2-13. How often the Kissimmee River is flooding? There have been significant changes made to the channelization of the river to actually increase the flooding which is beneficial. More discussion on this topic should be included.

7. Lines 1050 to 1055 on p. 2-57 talk about the critical level of 11 ft in Lake Okeechobee. What is the reference of this level (the deepest point or average?). The average depth is less than 9 ft. Also what is NGVD?

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

1. Line 100 on p 2-5 states that "The development of South Florida has required a complex management system to manage …..". It has been proven that some of these complex management systems have been actually damaging and were not required. This issue should be addressed in the report.

2. The two paragraphs between lines 299 to 313 sound like an introduction and should be moved up front.

3. It would be wise in the 21st century to provide metric conversions to US units. Most of US government reporting requires SI units or at least conversions throughout the report and this chapter.

4. Line 629-630 p2-35 to 36. The drought of 2006-2009 was regional affecting entire southeast not just South Florida.

5. In Figures 2-20 to 2-22 the dashed line is not visible in the legend box.

Are findings linked to management and objectives?

1. This chapter extensively discusses water management and manipulation. However, only two objectives were mentioned (1) flood control, and (2) water supply. The ecological dimension of the water management in South Florida is not well covered, especially in this chapter. Are there any ecological objectives stated and incorporated into water management, such as beneficial effect of flooding, minimum ecological flow, mitigating impacts of channelization and ecosystem fragmentation?

2. The section on Water Conservation Areas (p2-63) should begin with stating the purpose of the WCAs, without it the discussion is overwhelming with details of management, gate closing, etc. without knowing what was the purpose and impact of these actions.

3. How does all of this hydraulic management differ from the natural pre-management system?

Integrative Review

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

1. The chapter does not clearly describe the effects on the recent system management and channelization changes, especially on the Kissimmee River.

2. The chapter contains brief references to many "large picture" programs, for example, for ENP (pages 2-66 +) without stating what they are; what are the major requirements, and how the water management and manipulation program outside ENP affect the national park. The list of key "large programs" dealing with ENP should be presented and explained.

Throughout the chapter presentations were made on WY 2010 hydrology year. Is the hydrologic year different from the calendar year which is common in hydrology? In Chapter 10 the WY2010 graphs were made from May to April. The calendar year has not ended; hence, the report cannot make statements such as "WY 2010's hydrology was wetter than usual" (line 1395) when the report only covers a portion of the year. This should be clarified throughout the chapter.

Posted: 09/08/10 at 1:11 PM by V. Singh

This chapter is well written, well organized and well presented. There are a few comments for purposes of further strengthening the chapter.

1. Chapter title: The term environment has a much broader connotation than what is described in the chapter. Therefore, I suggest that the title of the chapter should be amended.

2. I think a short abstract will be useful. The summary as such is too long.

3. General comments: It will be desirable to have a discussion on (a) the impact of climate change on hydrology, (b) the impact of land use changes on hydrology, and (c) the impact of changing demographics on hydrology. Each of these topics will require separate sections. These three factors, climate change, land use change and demographic change, have a direct impact on water management, energy management and environmental management, and the South Florida region is experiencing all these changes. Therefore, what water management strategy will look like in the foreseeable future under the influence of three changes should at least be explored. Water managers should be interested in learning more about the linkages between hydrology and these changes.

4. Extreme value statistics: It will be desirable to have two sections on statistical description, including probabilistic, of peak flows and the other on that of low flows.

5. Future outlook: It will be a good idea to have a discussion on the future outlook or what the hydrology will be like in the future and how it will impact the water management strategy.

6. Minor comments: These are given below:

Page	Line	Comment
2-1	18	The sentence-surface water flows during the dry season-should be rephrased. It gives the impression that it does not flow during other seasons while it does.
2-1	61	Change: to various to on various.
2-4		Table 2-1: The term discharge normally denotes volumetric flow per unit of time. The way it is being used in the table is volume of flow. I suggest change discharge to volume of flow.
2-5	119	I think rivers should be Rivers. If I am not mistaken, lower case r in the name of river(s) is used if there are more than two rivers. You may want to check-I may be mistaken.
2-5	84-86	
2-6	127-129	The description here does not match that in the above lines. Make them compatible.
2-6	143	Insert a after on.
2-9	235	Change when to as
2-35	633	Replace depth by amount.
2-36	650	Change less of to less.
2-49	885	The discussion is less than clear.
2-64	1207	Change rose to rise.
2-64	1222	S-10 structures should be S-10 structure. Check.

PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2011 SFER – VOLUME I, CHAPTER 3A

Level of Panel Review: Accountability (primary); Integrative (secondary)
Reviewers: V. Novotny (AA), R. Ward (A)

Posted: 09/17/10 at 10:49 AM by V. Novotny

Accountability Review

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

Robert C. Ward

1. The current District monitoring programs were described by Germain in 1998 (line 297). Germain (1998) is not a 'live' link in the SFER, thus it is difficult to follow up the brief monitoring program descriptions in Chapter 3A with a more specific evaluation regarding how water quality data originate for placement in DBHYDRO (a major source of data to support Chapter 3A's computations). Is Germain (1998) online? If so, could it be made 'live' in the text? Given the many changes in the District's water quality monitoring efforts over the past 12 years (e.g. lines 486-487), are there plans to update Germain (1998)? The Panel had been led to believe such an update was in progress, under a 'monitoring re-engineering' effort, but there is not longer mention of re-engineering monitoring efforts in the SFER. Why? Are there new plans to update descriptions of the District's monitoring programs?

2. What is the cause of the long-term reductions in specific conductance levels reported in lines 649-650?

Vladimir Novotny

3. No quality and potential contamination of sediments (substrate) were found. Sediments store and bind hydrophobic contaminants (pesticides, metals, including mercury, phosphorus) and may provide history of past contamination. Furthermore, due to the increased sulphur inputs from the agricultural areas into the EPA (see Chapter 3B), the retention capability of sediments may change and some pollutants may be released as it is occurring now with mercury. Routine but not necessarily frequent sediment sampling should have been included. In the reference section there is no literature source listed that would address sediment quality.

4. The equation for the site specific minimum DO standard on page 3A-22 seems to be formally incorrect because it puts the variable t_i into the denominator instead of nominator. When the standard is calculated for 6:00 am (360 minutes after midnight) and 30^o C temperature, the minimum DO standard comes as DOL = 2.35 mg/L which is lethal to fish and other aquatic organisms. For 6:00 pm the standard is 5.35 mg/L. Temperature in EPA in summer can be expected to be even greater than 30^o C. Hence, the standard may not be protective but to what degree it resembles natural conditions is not clear.

5. Table 3A-3 on pages 3A-20-21reports violations of the DO. In 2010 the site specific min DO standard, which is already in the lethal range, was violated in 18.8 % of samples in the interior of the refuge area, 45% of samples in WCA-2 zone, 17.6 % in the interior of the WX-3, meaning that the aquatic organisms anticipated frequently lethal DO concentrations. Fortunately, excursions of the standard did not occurred in 2010 in the park area but, because of the unprotective nature of the standard, some damages to the sensitive biota could have occurred. Federal criteria allow the minimum DO standards (which are much higher) to be violated in less than 1% of samples. A much worse situation with the excursions of the minimum DO standard had been typical for years prior 2010. Because of this conflict between federal DO criteria and implicit lethality of the standard, we should ask whether an Use Attainability Analysis has been done?

6. Page 3A-17 correctly states that the 10% standard excursion frequency cannot be used for pesticides and by the same reasoning for un-oxidized ammonia which is also in the category of the priority pollutants. Because both NH^{+}_{4} and NH_3 are toxic, the latter one more toxic than the former, US EPA developed criteria for ammonium, which combines both ammonium forms together, that are based on moving averages of daily samples. Since daily sampling is rarely done, moving averages must be calculated by Monte Carlo simulations[1] and the allowable excursion of the CCC and CMC standards which also must be calculated from temperature and pH can have only one excursion in 3 years (approximately 0.2%) which is also true for other toxic compounds (pesticides and metals). Luckily, un-oxidized ammonia was not a problem (based on the old standard) in 2010 but it was a problem in the previous years. Unionized ammonia water quality was discussed on page 3A-26.

7. Specific conductance (pages 3A24-25) in the inflows of the refuge area and WCA2 area seem to be high and at the level that could be dangerous to fresh water aquatic life. Salt ground water intrusion was specified as a probable source which itself may be a problem. It looks that the frequency component of the specific conductance (salinity) standard was misinterpreted. Logically, the 1,275 micromhos should not be perceived as permanent salinity, which seem to be the case.

8. Pages 3A-33 till 3A54 deal with the phosphorus in the EPA. Phosphorus load and internal concentrations are the major stresses. The native flora in the EPA is adapted to very low nutrient-poor conditions that would be characterized as oligotrophic. The state of the art knowledge and criteria characterizes oligotrophic state of a water body which is phosphorus limited as the one where phosphorus concentrations are less than 10 µg/L, mesotrophic between 10 and 20 µg/L, and eutrophic with P concentrations of more than 20 µg/L. Many states have only narrative criteria for phosphorus, numeric criteria for Florida may be developed soon. FDEP interpreted the narrative criterion as being 10 µg/L for EPA. This criterion is applicable mainly to the interior of the water bodies. Figures 3A10 and 3A-11 show that the 10 µg/L criterion is way exceeded in the inflows into the Refuge and WC zones but is now (2010) maintained in WC-3 and Park zones.

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1. See C.S. Melching, V. Novotny, and J.B. Schilling (2006) Probabilistic evaluation of ammonia toxicity in Milwaukee=s Outer Harbor,@ WATERMATEX 2004, IWA Specialized Conference on System Analysis and Integration Assessment, Beijing, China. November 3-5, 2004, 8 p., published in *Water, Science and Technology* **53**(1):109-116

The progress in reducing P concentration is evident. However, very high P concentrations in inflows is still a warning.

9. Using geometric means for expressing P concentration and excursions is appropriate for water bodies with a very long retention time. Concentration of less than or equal 10 µg/L are today maintained throughout the interiors of all four zones of EPA (Figure 3A-14 on page 3A-42)

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

Robert C. Ward

1. On page 3A-14, the data screening methods are described. Regarding consistency from year-to-year, how many years have the data screening methods been the same or are they tweaked each year?

2. Lines 493-494 mention that future phosphorus criterion achievement assessments will improve as additional datasets for all sites within the monitoring network are added. Lines 545-547 also mention insufficient data available for assessing DO assessments. Lines 1152-1153 report that *even with the data limitations*, the un-impacted portions of each WCA passed all four parts of the compliance test. This statement is confusing in that it implies the data limitations did not limit the ability to complete the criterion compliance test. Should this conclusion be further clarified to state that at the sites with sufficient data, the criterion compliance tests were met? Or did the data limitations not prevent use of the criterion compliance test, in which case they are not data limitations from the standpoint of applying the test?

Vladimir Novotny

3. Pages 3A-8 to 3A-19 describe the water quality monitoring program of the Everglades Protection Area. Acronym EPA is sometimes confusing to a reader who is new because in almost all other states it is associated with Environmental Protection Agency (denoted in the report as US EPA). Page 3A7- which is a start of the Chapter should have clearly introduced and identified the acronyms used throughout the chapter. This applies to most chapters in the SFER.

4. Page 3A-19 is the beginning of the water quality excursion analysis and excursions of water quality standards. Although the standards for the analyzed constituents are mentioned (hidden) in the subsequent text there is no summary table of the magnitude of the standards. Federal criteria in pertinent documents and summary of Water Quality Criteria specify standards and criteria in terms of magnitude and duration and frequency of allowable excursions. A table of the pertinent magnitudes of the standards should be included in this report. A reference to previous annual reports is not sufficient.

5. Table 3A-1 lists allowable frequencies. These are consistent with the US EPA guidelines for Clean Water Act (CWA) Section 305 screening annual reports of states to US Congress but are in conflict with the federal water quality criteria (and most likely state standards because states were required to accept federal criteria) whereby the durations and frequencies are more stringent. States are allowed to adopt less stringent site specific standards as it occurred, for example, for DO (line 535 on page 3A-22), only if a

scientific Use Attainability was performed. Naturally low DO could justify lower DO standards but these may not be typical for low nutrient (oligotrophic) natural water bodies such as the EPA. Using the Section 305 reporting frequencies of excursions is inappropriate for water quality assessment.

6. Pesticides have not been compared with the priority pollutants criteria. In most states and presumably also in Florida, federal criteria for priority pollutants have or should have been adopted as state standards. The report speaks about the "guidelines" but if the "guidelines" are the same as the federal priority pollutant criteria they are the standards in a legal meaning. The SFER compared pesticide concentrations only with maximum detectable limit, as it appears. The pesticide section indicates a problem, including in the park, but it is not specific.

7. Section on Total Phosphorus Loads (pages 3A-46 -53) is suffering from inconsistencies with units. This report should be a representative scientific report that should use at least both SI and US (one in parentheses) throughout the entire report, which is not the case. Using archaic units such as acre-ft may not be appropriate today without reporting a metric equivalent (m^3) . Also it took the reviewer a while to decipher what is mt (is it milliton, megaton and is the ton US or SI units?). A metric milliton is kilogram but milliton is not used at all. In metric units m denotes milli and M denotes mega but this section has it all mixed up. It is also inappropriate to mix US and SI units in one table (for example, mg/L and acre-ft) without providing conversions. US equivalent for mg/L used to be years ago grains/ac-ft but today no one uses this unit.

Are findings linked to management and objectives?

Robert C. Ward

1. Chapter 3A is driven by legal reporting requirements, thus its contents support management goals and objectives related to implementation of the Everglades Forever Act (line 218).

2. Figures 3A 10-13 indicate reduced variability, over time, among annual Geometric Mean TP Concentrations. 1994 seems to be the breakpoint at which time variability is noticeably reduced. What caused this reduction in variability? Was it improved consistency in monitoring system design and operations, or impact of STAs coming on line, or both? Or is there another explanation? The flows presented in Figures 3A 16-19 do not reflect as dramatic a reduction in annual variability.

Vladimir Novotny

3. Chapter 3A contains relatively little discussion that would link water quality assessment findings to management objectives.

Integrative Review

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

Robert C. Ward

1. The SFER, apparently for regulatory reporting reasons, places considerable focus on water quality standard compliance in the Everglades Protection Area by devoting Chapter 3 to the subject. Compliance with water quality standards in the Kissimmee Basin, Lake Okeechobee, and coastal ecosystems is addressed in separate chapters devoted to the separate regions. This split in focus on water quality standard compliance does not result in an easy to grasp view of District-wide water quality standard compliance.

2. Evolution of water quality monitoring in South Florida is reaching the point where more integration of water quality outcomes with broad scale restoration goals should be explored. Chapter 8, in particular, could be connected to findings reported in Chapter 3A (as well as Chapters 10, 11 and 12) to gain a District-wide accounting of water quality changes connected to implementation and operation of restoration projects and programs.

Vladimir Novotny

3. Chapter 3A contains the water quality assessment situation with excursions of standards and criteria and trends in water quality without a reference to the causes of the problem which are addressed in the chapters dealing with the agricultural areas and tributaries to the EPA. Chapter 7 and 8 deal with restoration but without a reference to the current and past water quality problems. The link between the water quality assessment and restoration alternatives seems to be ignored. True, these chapters were written by different authors but it seems that the teams did not communicate.

PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2011 SFER – VOLUME I, CHAPTER 3B

Level of Panel Review: Accountability (primary); Integrative (secondary)
Reviewers: J. Burger (AA), O. Stein (A)

Posted: 09/16/10 at 10:02 AM by J. Burger

INTEGRATIVE

Mercury and sulfur issues cross-cut several chapters, and this years report makes a better attempt to include mercury and sulfur in these chapters. The problem remains, however, that the SFWMD is not primarily responsible for the research with mercury, making it more difficult to integrate the findings with the other chapters, and with the overall program of SFWMD. It is not clear that the integration occurs in the management and recovery decisions, but rather within sections of the report itself. Integration of mercury issues could be clearer in Chapter 12 having to do with the estuaries, and in Chapter 9 having to do with ecological studies. Issues discussed in the mercury section of chapter 5 are not well integrated with 3B, and the role of the STAs in mercury accumulation in the Everglades generally needs to be further explored. Relative differences in methylation in the STAs should be further explored in chapter 5. Information on hydrology (chapter 2) is integrated in the sense that the models include hydrological factors.

TECHNICAL

The Mercury and Sulfur Monitoring, Research and Environmental Assessment chapter (3B) is an excellent overview of the mercury and sulfur problems in the Everglades, on-going problems with high levels of mercury in bass (a fish at the top of the food chain that serves as an ecological bioindicator, and is consumed by people), how mercury and sulfur interact with other nutrients (and with each other), on-going research with biota and mercury, the role of sulfur, and the new research initiatives to understand mercury and sulfur cycling, as well as sulfur eutrophication.

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 makes the main points clear, as well as making the data readily available to scientists not familiar with the Everglades. Appropriate references to the primary literature are a key component of the report.

Authors have also done a commendable job to improve the statistical analysis of time and spatial trends in LMB mercury in response to last year's suggestion. As anticipated, the statistical analysis of time trends seem to weaken last year's claims to large reductions in LMB mercury with time, as only two of the five sites show a statistically relevant decrease. Nevertheless, there are still at least places in the document where reductions in time are stated, but not warranted by the data. These should be removed. Specifically, lines 240-241 indicate reductions with time (in this case for Florida panther samples) but with the large standard errors shown in the 1978-1991 data in Table 3B-3 it is highly unlikely, at least for blood samples. Regardless, a statistical analysis should be conducted before time trend statements can are made.

As stated last year "*Once suspected trends are confirmed, the next step will be to determine why. This is necessary if Floridians have any hope of making long term improvements. Questions in need of answers include but are not limited to:*

A) What caused the readily observable decline in the WCA up to about 1999?

B) Why has there been no improvement since?

C) Why have those generally not been repeated in the areas further south in the ENP?

D) What causes the general north south increase in mercury?

E) Why does STA-1 data seem to show much lower levels?

F) Could the mechanism apparently at work in STA-1, be employed elsewhere?

G) Do annual concentration variations correlate with annual variations in hydrology?"

The authors have speculated answers to questions A, B, (related to hydroperiod) and perhaps C (difference in sulfur and organic carbon), but the other questions remain unanswered despite there continued validity, and should be answered where possible.

The normalization of LMB mercury concentrations to length is a cause of concern. If normalizing parameters can reduce variability of the data (presumably by factoring out co-variates), their use is recommended. However the authors provide no information as to how this normalization helps. In fact, the plot shown in figure 3B-7 indicates it doesn't improve anything. The authors should indicate why dividing by length is an appropriate normalization method. One could assume that multiplying by length would be equally appropriate. Further, (and more importantly), the plots and presentation of the data suggest that the normalization was not done as described in lines 396-403. If concentration is divided by length (either mm or inches) then the resultant units must be in ppm/length and not ppm. So apparently the described normalization is not what was conducted or alternatively what was conducted is not properly described.

Mercury in Fish and Wildlife

They have effectively used bass as bioindicators of mercury exposure (although data on a short-lived species such as mosquitofish are also useful), and have one of the longest running such data sets in the country. The Hg data on bass continue to remain one of the most important long-term data sets in the country, both for understanding differences within the Everglades, and for understanding the potential for human exposure. Still, the Hg hotspots remain, and require further study, especially the potential effect of dry-downs on Hg methylation and accumulation in bass in the STAs

The inclusion of data on mercury in Florida Panther and the Burmese Python are interesting, and will potentially be very useful because of the critical status of the panther, and the high trophic level of the python. The Alligator data is both important biologically in terms of understanding trophic dynamics of alligators and the food chain, but also because of the threat to humans that consume them – this research should have a high priority. The panther Hg data, particularly for Big Cypress National Preserve, is disturbing even if not yet significant, and suggests the need for a focused study on mercury in different components of the system. Readers will miss data on Great Egrets, missing from the main Chapter 3B (although some are in appendix 3b-1). The graph showing Hg concentrations in feathers was a useful bioindicator that is missing in this report, and should be added in future reports.

The major problems are noted, along with new research needed to understand how to reduce mercury levels further, particularly in fish in the Everglades National Park, in the Everglades Protection Area, and in the Kissimmee River Basin. All three are problematic because of the longevity of the fish, and their consumption by people. Further, eutrophication is a problem that requires additional study, which is on-going.

The data, models and conclusions in chapter 3B (and in the appendix) reflect the complex problem faced by many agencies dealing with mercury and sulfur in freshwater ecosystems,

particularly since often the problem relates to atmospheric deposition (sources of mercury from elsewhere not under their direct jurisdiction). The data generated by the various agencies, and the SFWMD, are proving useful for other aquatic ecosystems throughout the United States.

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

The findings are exciting in that they include four important areas: 1) Continued biomonitoring to explore temporal and spatial trends in mercury (bass, panther, alligator, and python data are extremely important within this context),) Results of experiments to determine if the mercury levels are having effects on key bioindicators (wading birds), 3) The relationship between mercury and sulfur, 4) Assessment of practical approaches to reduce sulfur levels and restore the appropriate hydro pattern, and 5) Studies of Mercury hot spots and eutrophication. The inclusion of previous findings provides a context for the current work, and allows the general reader to get up to speed with previous work (although hot links would help). The inclusion of sufficient references in the previous findings was extremely helpful, and continues to be important in each report.

Problems that remain mainly include: 1) Lack of clarity with respect to on-going monitoring, such as Great Egret feather Hg levels, 2) Lack of clarity with respect to which data are in Chap 3B versus in Appendix 3B-1, 3) Insufficient detail to evaluate the individual studies (although the appendices provide some of the needed information, 4) Lack of a context for levels in fish with those from other southeastern areas, 5) Lack of variance measure for some of the tables, and 6) Lack of statistical analyses of some trends (see section below). The provision of information on lakes impaired north of the ENP was extremely useful.

The Wildlife section would profit from an information needs and recommendation section, similar to the one provided for the Sulfur section. While the mercury program is obviously much more extensive, far-reaching, and long-term, it would still profit from an overview look at research needs, given the new emphasis on both mercury and sulfur.

Sulfur Levels, Sources and Effects

The Sulfur issue in the Everglades is critical not only because of its effect on methylation, and thus potentially toxic levels to humans and wildlife, but because of the potential for affecting other biogeochemical cycles, and its potential toxicity to plants and animals. This section provides extremely useful background information, but not a clear statement of objectives for this section, or for the experiments conducted. The authors provide a particularly strong summary of the interactions between sulfur and mercury problems in the introductory section on pages 27-35. This section is an excellent overview of previous collected information. .

The relatively new emphasis on determining mass balance of sulfur within large sections, and smaller sections (such as the STAs) is critical to determining how to best handle management of sulfur levels. The STAs may have a critical role in understanding the relationship between sulfur levels and Hg meythlation, but also in examining the effect on Hg levels in fish.

Research Reports

The overall research described in the chapter is important, timely, and will add greatly to understanding of mechanisms, as well as meeting management and RECOVER goals. However, the specific objectives of each project, the expected outcomes, and the relationship to RECOVER goals is not always clear. Further, some of the quantitative data are not presented graphically (e.g. Hg effects on birds). It would be useful to have a general format for each research section, so that all include objectives, background, results, future result or information needs, and relevance to RECOVER goals.

Further, In general, a description of the individual research projects is adequate for this report, although some questions and comments are provided by line number below. Despite this general adequacy, an introductory section explaining how these studies interact is required but presently missing. As written, it would appear that there is significant overlap and potential redundancies between individual studies. For example, it seems the goals and objectives of the E-MCM/D-MCM study is very similar to the ACME Phase III, and for that matter, similar to the Regional Mass Balance Study. How will results be integrated or alternatively is it necessary to look at the same issues from three different perspectives? The District needs to consider if all these simultaneous studies are required, and if they are all justified, how information and data will be shared by each performing group and otherwise integrated.

The models for understanding Hg and sulfur in the Everglades remain one of the most important research projects because it can both lead to an understanding of the mechanisms, but also to RECOVER goals. Integrating the two will require considerable time and effort, and future targeted research to address specific data needs.

The South Florida Hg Hot Spot Study is an extremely important effort that will provide data for many different questions regarding the methylation and bioaccumulation of mercury in the Everglades. The SFWMD is the leader in understanding Hg dynamics in freshwater systems, and this project will greatly enhance these efforts.

TECHNICAL COMMENTS AND QUESTIONS

Mercury in Fish and Wildlife

Historical Monitoring

Line 41: Is alligator meat still under a ban?

Mercury in Fish and Wildlife

Alligators

Line 80: Could you provide SE or other indication of variance

Line 84+: It is difficult to evaluate these results without knowing the size of the alligators in question? Are alligators of only a certain size collected for me? What is the range.

Line 104: Table 3B-1: Please give SE or SD. In terms of health the Hg values are critical, but in terms of understanding mercury bioaccumulation, it is essential to know the relationship between size and Hg levels.

Line 131 Management Unit (AMU) where multiple testing was performed, while only 1 individual was tested from

Line 160-161 MeHg criterion, recent declines have been evident (Gabriel et al., 2010a). It is possible that the concurrent declines have occurred in alligator tissues.

Line 164: Were there 12 animals harvested from each site or a total of 12 from all the WCAs combined?

Line 166: Lower than what? The meaning might be implied, but is not clear.

Line 179+: Continued sampling of alligators from areas where humans will hunt (and consume the meat) is a critical need, especially given the variability in Hg hot spots in the region.

Panthers

Line202-209: highest tissue Hg concentrations because raccoons had THg values 10-100 times higher than deer. Raccoon comprised 70 percent or more of the diets of Shark River Slough panthers, which had highest muscle and liver THg concentrations, while panthers north of Alligator Alley along the western extent of their range had lower overall mercury levels and fed primarily on white tailed deer (*Odocoileus virginianus*) and feral hogs (*Sus scofa*). Similarly, Roelke et al. (1991) observed declines in panther THg levels during the late 1980s in Fakahatchee Strand in response to changes in diet from one dominated by raccoons to deer after management actions increased deer populations.

Line 210: However, if the panthers are eating raccoons, then the levels in raccoons should also be examined (have they declined?)

Line 232-239: Please provide the means and other relevant information, not just the range.

Line 248+ Is there any indication that they are changing their diets accordingly?

Line 260: Figure 3B-2: Please provide an explanation for the values of the boxes and whiskers. Are they percentiles, ranges, SDs or SEs? Table 3B-2: Was there one composite from each site. Again, the large range in carcass size makes this difficult to interpret, particularly since the composites contained so many, and the size range was so great.

Line 272: The increase in Hg concentrations in panthers is disturbing, and suggests that Hg in other components of the food chain in Big Cypress NP need to be examined.

Burmese pythons

Line 305: Does diet differ by age or size?

Fish

Line 329: Using both methods was an excellent idea, and this is not often done in other studies.

Line 416: Figure 3B-7: Since points overlap emphasize that plot contains 5281 point (if this is true).

Line 420-421: Furthest south, in Shark River Slough in ENP, a total of 539 LMB have been collected yearly for mercury analyses from two sites, L67F1 and ENPNP, since 1989 **(**Figure 3B-8). Regional

Line 431-432: would not be expected to sequester available methylmercury, in the process making it unavailable for bioaccumulation. In fact, bioaccumulation factors (BAF) for mosquitofish were higher in Shark

Line 424-426: Drop these two sentences as the following lines demonstrate that there is no seasonal trend.

Lines 449+: Has Hg been measured in these other species (is it about the same as the bass)?

Line 465: Table 3B-9: Any indication of why Hg seems to be cycling but not staying at the lower levels?

Lines 490+ Are the consumption advisories effective, or should actual bans be in place?

Line 497: Figure3B-10: The red line representing 0.3 ppm is not at 0.3 ppm.

Line 517: What would happen, however, if water levels were very low, exposing some of the marsh?

Line 530: The effects of drying on methylation and Hg levels in fish should be a high priority (especially given global climate change and potential for serious droughts).

Line 534: Fig 3B-11: A greater understanding of why Hg hasn't been high in this STA might help overall understanding of trophic dynamics.

Line

Line 577+ *Has there been any attempt to model Hg concentrations as a function of both physical and biochemical factors in the STAs (or the Everglades generally).\? The effect of frequent wet/dry cycles needs to be more fully explored

*The meaning of the beginning of this sentence is not clear but is probably due to a typographical error. Please correct.

*The inclusion of the estuaries and Kissimmee Chain of Lakes is an important aspect of this report.

Line 562 0.20 – 0.90; n = 40), a 49 percent decrease **(**Figure 3B-13). A seasonal Kendall analysis

Line 565-566 Hg levels in LMB and other large-bodied piscivorous fish remain at or above the USEPA MeHg criterion for the protection of human health throughout the Kissimmee Basin.

Line 612: evidence that sulfur applications to EAA soils are no longer beneficial in regards improving crop

Line: 618: In the 1980s, Florida state agencies monitoring mercury levels in freshwater fish statewide,

Sulfur Levels, Sources and Effects

Line 612: evidence that sulfur applications to EAA soils are no longer beneficial in regards improving crop

Line: 618: In the 1980s, Florida state agencies monitoring mercury levels in freshwater fish statewide,

Line 623: highest reported worldwide for water bodies without direct input of mercury from industrial

Line 633: While the claim of a 70% reduction in Hg within the ecosystem may have been made previously, the data provided in the mercury section of this chapter dampens this claim and therefore this is overstated here as well as in previous sections.

Line 644+: This is an excellent summary of the problem, but it might be useful to state the objectives for this section overall.

Line 693: In regards to sulfide toxicity to aquatic animals, recent data (from W. Orem, USGS, as below)

Sulfur sources and levels

Line 729: This is a useful section.

*It is still clear that there needs to be a statement of objectives for this section of the report. There is much background information of sulfur and the sources of sulfur, but no clear statement of objectives or what the report means to communicate in this section.

Line 757: There have been recent attempts to determine EAA sulfur mass balance; Gabriel (2009)

Effects of Sulfate Loading

Line 806: Where there experiments, what were they, what was the objective?

Line 811: NW WCA-2A ranged from 5-17 mg/L, but average concentrations since then have averaged

Line 823: between 7 and 8. All sites sampled in NW WCA-2A exceeded EPA standards of 2 μg/L free H_2S

Line 818-825: The mean of this paragraph is confusing due to the use of terms "free sulfide" and "free H_2S". Are these the same thing, or does "free sulfide" refer to the free S^{-2} ion?

Line 848: Was this a transect sampling, away from the canal.

Line 862: sampling efforts were those from the lower C111 canal, which revealed some of the lowest

Line 874-875: the ENP versus the WCA is not clear. Last, the results from the small fish (we selectively analyzed mosquitofish only) analysis showed a spatial pattern that agrees very closely with the MeHg

Line 873-876: The authors claim that the sulfate concentration triggering inhibition is different in the ENP versus the WCAs, but the trigger point for the WCAs is not provided for comparison. Also, it is probable that there would be an interaction between this trigger value and DOC concentrations. It plausible that higher DOC would increase the inhibition trigger, as higher DOC would further stimulate SRB activity making them more robust against inhibition. It is good to see this is recognized in the research plan (lines 1126-1129).

Elemental Sulfur Use for Sugarcane

*Some of this information should be modeled to provide insights into the total sulfur budge.

Line 894-948: In most cases numbers in chemical formulas are not subscripted

Line 941-942: 448 kg/ha or 400 lb/ac) did not increase sugar yield. There may thus be a need for agricultural S application rates greater than 448 kg/ha to overcome the soil's CaCO3 buffering capacity, and thus release

Information Needs and Recommendations

*An excellent section

* The recommendations are all critical needs, but the over determination of mass balance for both the Everglades generally, and for individual sections (including the STAs) is a very high priority, as is determining the potential effect on Hg levels in fish of sulfur reduction.

Line 966: Quantify the sources to, and the sulfur mass balance for, Lake Okeechobee.

Research Progress

No Effect Level for Fish-eating Birds

Line 1009+ This initial paragraph should have citations. A little more context for why this has been a problem in terms of population declines should be mentioned.

Line 1058: These are extremely important studies and results, but it should also be considered that effects could be less in the field, where there are even more changes for matings and pairings. Without field experimentation, this is difficult to determine, but the possibility should be mentioned.

What about foraging effects, particularly in drought years?

Revise Hg Cycling Model

Line 1100: This aspect is extremely important for the overall Everglades models.

Biogeochemical Controls on Mercury Methylation

Line 1117+ This is an excellent choice of study sties

Line 1132+ Excellent statement of relationship of research to management goals.

Statewide Hg TMDL

Line 1168: How does this relate to other states, or specifically to the SFWMD?

Line 1223: What is the relationship to what will be done in the Everglades, or to the specific hot spots for the Everglades?

Hg in Coastal Waters

*This is an important research area.

Line 1248: Its less clear to me how a regulatory TMDL will work for coastal waters.

Line 1280: Another issue to consider is the migratory nature of some fish (who pick up Hg elsewhere)

Line 1267: How extensive has the sampling been of Gulf fish for Hg, especially those that are non-migratory.

Regional Sulfur Mass Balance

Line 1296-1315: A stated objective is to capture variation in sulfur fluxes due to precipitation. Even though data is reported on an annual basis, it seems highly unlikely that this is possible with monthly or, worse, bimonthly sampling. Perhaps rather than collecting grab samples, ion specific probes or flow weighted samplers could be employed, or at least more detailed sampling with in time frame of individual events could be conducted to better estimate flow weighted sulfur mass fluxes.

Line 1299. What about the STAs; Line 1325: Can you tell the difference between short-distance and long-distance atmospheric sources?

South Florida Hot Spot Study

*This is an extremely important study as it provides information for several different key questions.

Line 1354: Are any more data available.

STA/WCA Internal Eutrophication Study

Line 1375+ Is Hg going to be integrated at some point in the study?

Line 1401: Is this results report available?

Line 1430: Was Hg measured in any of these experiments?

1441-1447: The difference between the treatments “flooded with unamended water” (line Line 1443) and “unamended overlying water” (line 1446) is not apparent. Please clarify.

Line 1448: Figure3b-18: Credit for the photos in caption needs to be updated.

Line 1486: Figure3B-19: The within-figure captions (within the boxes at the top) are not legible.

PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2011 SFER – VOLUME I, CHAPTER 4

Level of Panel Review: Accountability (primary); Technical (secondary)
Reviewers: V. Novotny (AA), R. Ward (A)

Posted: 09/17/10 at 10:54 AM by V. Novotny

Accountability:

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

Comments by Robert C. Ward

1. Tables 4-13, 4-15, 4-17 etc. indicate considerable variability, among the sub-watersheds, in percentage of 15-year historical average TP loads and percentage of 15-year historical average flow. It is not clear why subregion variation would be so great. What causes the flow and loading variation among the sub-watersheds during one year and from year-to-year?

2. Chapter 4 discusses water quality monitoring in a number of contexts. For example, lines 769-772 state there is an initiative to 'define' a monitoring network. Lines 795-796 note that a main focus of 2010 activities was to conduct monitoring to evaluate effectiveness. Lines 806-807 note another focus for 2010 was to continue to develop performance measures. Lines 808-815 indicates that the technical evaluation of the LOWA has been completed. Lines 831-833 discuss development of a Performance Measure Technical Support Document. The numerous references to past monitoring efforts, current evaluations, and future performance measure development makes it difficult to understand what data was used to develop the current Chapter 4, what changes might be coming for monitoring, and how performance measures might change. There is a need to explain the overall water quality monitoring strategy being employed in nutrient source control programs, including anticipated changes.

Comments by Vladimir Novotny

1. Page 4-2, 4-4 and throughout the entire report the beginning and end of the WY 2010 has not been defined; apparently it is different from calendar year and from hydrological year (October to September).

2. Page 4-5, Line 152 is the first noticed appearance of mentioning "predicted loads" (see also Table 4-24 and Figures 4-8 and 4-9)but the description of the prediction model was not found. Apparently the model generated estimates of TP loads without BMPs for a comparison with the years when BMPs were implemented. Based on this comparison claims were made that, for example, the EAA (Everglades agricultural areas) achieved 41% reduction of TP loads (page 4-6). Similar estimates were made for all other subwatersheds of the EPA.

3. Table 4-2 lists characteristics of ECP (Everglades construction projects) areas where only agricultural uses were identified. What are the non-agricultural uses ?

4. Page 4-10 lines 322 – 333 and page 4-17 mention the BMPs and pollution control load measures in the Lake Okeechobee watershed which exhibited TP reductions of 19%. Chapter 10 describing the same does not report very favorable results, essentially an impression can be made that most of the TP load control measures were not successful (with some exceptions such as hybrid wetlands and 19% reduction is statistically small to make any definite conclusions about the success.

5. Nutrients in urban discharges originate primarily from urban lawns. Apparently these loads are to be controlled by a rule establish9ng maximum applications fertilizers per are of the turf. How is this rule enforced and how successful is it?

6. Figure 4-6 on page 4-19 shows unit area loads but it does not identify of what. Presumably of TP.

7. Considering the fact that the unit loads on Figure 4-6 and in Table 4-3 fluctuate widely for apparently similar lend uses what is a justification (if any) for these wide fluctuations? Apparently the 19% reduction is within the statistical error.

8. Table 4-5, 4,7, 4-9, 4,11, 4-13, 4-15, 4-17, 4-19 and 4-21present the comparisons of the annual observed TP loads and flows compared to their historical averages (1991 to 2005 – before BMPs were implemented). By observation of the values in the table it can be noted that the loads are closely correlated to flows. This is typically the case in most hydrological annual observations (e.g., annual sediment loads vs. flow) and the reason is the load is a multiplication of concentration and flow. This sometimes leads to (a) spurious correlations by taking logarithms of these variables, or (b) claims that loads are statistically as good as a constant times flow. But a plot of the annual load and calculated annual flow weighted concentrations vs. flow would be very useful. See also comment by W.C. Ward below.

9. Table 4-26 for C-139 area is similar to the above mentioned Tables 4-5 to 4-17 but it is more explanatory and accompanied by figures .

10. The above observation and hydrological facts leads to a question of what is a value of a single annual calculated TP load? Can any conclusions be made regarding the compliance with TMDL? If the year is dry then there is a compliance and if it is wet then it may not be. Hence, the loads and TMDLs must be treated in the same way as the excursions of the water quality standards, i.e., statistically in terms of probabilities.

11. The annual loads must have anomalies. In Florida hurricane Katrina passed over southern Florida. These anomalies could also show on a plot as outliers.

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

Comments by Vladimir Novotny

1. Chapter 4 reports and summarizes the results of nutrient controls in the entire Everglades watershed. Chapter 10 describes the same by different authors for the Lake Okeechobee. The finding and conclusions for the same upper portion of the watershed are not always in agreement

Are findings linked to management goals and objectives?

Comments by Robert C. Ward

1. Findings are linked to management goals via a complex mixture of models and data related to an annual percentage of TP load reduction from what might have been expected to occur if BMPs had not been installed. Connection of TP load reduction percentages to reaching compliance with water quality standards, as required in the Long-Term Plan per Chapter 8, is not well developed. Do the models take account of the need to meet water quality standards?

2. Following the above point, is it possible, using existing data, to draw conclusions regarding effectiveness of past *collective* source water control efforts in the Lake Okeechobee Watershed, realizing that the source control program is always evolving?

3. Will the future performance measures be connected to water quality standard compliance goal achievement?

Comments by Vladimir Novotny

1. This chapter cover source controls and somewhat overlaps with Chapter 10 for the Lake Okeechobee controls which showed mixed results. Are there any major differences between the Lake Okeechobee controls and controls in the entire watershed? What makes these controls work in one watershed and failing or inefficient in another one?

Technical:

Are the findings and conclusions supported by "best available information", or are there gaps or flaws in the information presented in the document?

Comment by Robert C. Ward

1. Table 4-1 includes a column of Unit Area Load of TP for sub-watersheds where 'agriculture' is the primary land use. The numbers in this column vary widely. Why do these numbers vary so widely when the primary land use is the same? Or is using the generic term 'agriculture' not permitting the table to highlight differences in agricultural operations in the different sub-watersheds?

Comment by Vladimir Novotny

Are crops different in the main watersheds of Lake Okeechobee and EPA?

Are there other interpretations of the data and other available information that should be considered by the authors and presented to decision makers?

Comment by Robert C. Ward

1. Why are the data summarized in Tables 4-5, 4-7, 4-9, 4-11, 4-13, 4-15, 4-17, etc not presented in plots, such as a time series plot or box-and-whisker plots? Box-and-whisker, especially, would permit a more in-depth understanding of the variation during a single year as well as between years. From the tables it is difficult to observe trends in the data. Are there trends and, if so, why?

2. When will findings from the C-139 Basin Upstream Synoptic Monitoring effort be available? Could a brief summary of the findings be included in the discussion at lines 1509-1511?

Comment by Vladimir Novotny

3. The suggestion on page 4-39 lines 766-768 "to establish ……a concentration base performance for collective source control measures… " is a very good idea instead of or in addition to using only loads that vary widely year to year based on precipitation and, inexplicably, from watershed to watershed.

If so, the panel shall identify specific studies that should be addressed or available data to support alternative findings.

Editorial comments:

1. Line 49 - Should there be an 'of' in front of adaptive?
2. Line 1007 – What is an 'into' structure? Something missing?
3. The link on line 1203 was to lead to a document on improved BMP effectiveness, but it could not be located. What clicks are needed to reach the document?

PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2011 SFER – VOLUME I, CHAPTER 5

Level of Panel Review: Technical (primary); Accountability (secondary)
Reviewers: O. Stein (AA), V. Singh (A)

Posted: 09/18/10 at 06:05 PM by O. Stein

Chapter 5: Performance and Optimization of the Everglades Stormwater Treatment Areas is to receive review primarily at the Technical level with consideration at the Accountability level. Accordingly, the following questions are addressed in this review of Chapter 5:

Technical Questions:

1. Are the findings and conclusions supported by "best available information," or are there gaps or flaws in the information presented in the document?

2. Are there other interpretations of the data and other available information that should be considered by the authors and presented to decision makers? If so, the panel shall identify specific studies that should be addressed or available data to support alternative findings.

Accountability Questions:

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

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

5. Are findings linked to management goals and objectives?

The review is divided in to several sections. Provided first are broad comments regarding the questions asked above. These are followed by questions and comments about specific sections, sentences, phrases, etc. expanding on some of the issues discussed in the broad comments. This is followed by comments on figures and tables and lastly, editorial suggestions.

Broad Comments:

As in the 2010 SFER, this year's lengthy chapter summarizes an impressive array of operation, maintenance, research, and other efforts that are in progress, recently completed, or planned in support of a District's goal to optimally manage six major stormwater treatment areas (STAs). The primary goal of these constructed shallow freshwater marshes is to remove phosphorus (P) from waters moving into the Everglades Protection Area from up gradient sources, including, but limited to, the Everglades Agricultural Area. This year's chapter is supported by 10 appendices – clearly a great effort by the authors to present a vast array of information. The District is world-renowned for its leadership in efforts to optimize constructed wetlands as sustainably functioning P removal systems – and the physical scale of these constructed wetlands is huge relative to other constructed wetlands. As in the previous year's chapter, an enormous amount of continuing work is represented here.

This chapter contains three very long and important major sections in addition to a few smaller ones. The first major section (STA Performance) addresses the mandatory reporting of regulatory water quality standards and the effectiveness of the STAs in achieving them. The second section (STA Performance and Condition Assessment) reports primarily on the conditions that affected performance for the current water year, but does provide historical perspective for some of the factors. This year more detail is provided on the studies of soil properties rather than other factors influence on performance. The third section (Vegetation Management Activities and Research Studies) primarily highlights the efforts to maintain and enhance vegetative cover in the STAs. As noted below, this is a new organizational structure for the chapter. Because the goals of the different sections vary, the answers to the five fundamental questions asked above sometimes vary depending on the section. Therefore when appropriate, the Panel's responses are separated accordingly.

Q1: Are the findings and conclusions supported by "best available information," or are there gaps or flaws in the information presented in the document?
Compared to previous years, there is considerably less reporting of scientific information in this year's Chapter 5. Most of the technical information presented this draft chapter is supported by a strong and clear rationale and by figures, photos, and tables that mostly are well designed and very helpful. An exception is the section highlighting the influence of soils on the STA performance, for which more information would be helpful. Detailed comments on this section are provided below.

Q2: Are there other interpretations of the data and other available information that should be considered by the authors and presented to decision makers? If so, the panel shall identify specific studies that should be addressed or available data to support alternative findings.
As mentioned above the District's reputation in advancing the science of larger-scale treatment wetlands and the list of projects completed or currently underway is truly impressive. In some cases the Panel questions some of the many specific interpretations presented in the draft report and these are discussed more specifically in later sections of this review, but in general, the District has done a good job of data interpretation. The impressive list of projects in this chapter demonstrates the diligence of the District in conducting studies to improve and optimize the STA performance. However listed below are a few additional topics the district should consider.

- Why are floating tussocks/ tussock islands consistently viewed as a concern, when in stormwater control elsewhere, floating islands are being considered as potentially a valuable best-management –practice for improving water quality through pollutant reduction?

- Has the potential for the massive areal herbicide applications to adversely affect desirable SAV been evaluated?

- The difficulty in measuring soil topography and below water surface vegetation is clearly limiting better management decisions. The district should explore many of the newer hyper-spectral remote sensing techniques for making these ground and SAV vegetation studies.
- In previous reports vegetation die off has been primarily linked to too high or low fluctuations of hydro-period, yet this year's massive die off of Hydrilla and other SAV species was observed even though WY 2010 was not a drought year, and water levels were managed relatively close to optimums. The influence of cold temperatures and wind

speed vs. fetch length should be explored and other important factors affecting vegetation health.

- The district should make an assessment of climate change impact on the performance and optimization of STAs.

Q3 Does the draft document present a defensible account of data and findings for the areas being addressed that is complete and appropriate?
The Chapter 5 draft presents a defensible scientific account of data and findings for the areas addressed. As in last year's version, the chapter describes many ongoing, diligent efforts to track STA performance at P removal, major rehabilitation efforts for the STAs that have declined in efficiency, and an active research program maintained by the District for optimizing and sustaining STA performance. A topic that could be enhanced is the description of how the interim effluent limits of the EFA permits are calculated. Since every STA but 3-4 was out of compliance with this permit, more detail of how it is determined is certainly warranted. Last year the report went to great lengths to explain the technology-based effluent limitation (TBEL) permitting requirement for all STAs except STA-3/4, but TBELs are not even mentioned this year. Is there some linkage between Interim Effluent Limits and TBELs? Overall, the description of the permit requirements is weak.

Q4: Is the synthesis of this information presented in a logical manner, consistent with earlier versions of the report?
The authors are commended for their commitment to following the recommendations for restructuring the chapter made by the panel last year. The Summary section is improved though perhaps too long; a new Introduction section describes the organizational structure of the chapter, directs the reader to appropriate sections for specific information and contains a table listing the contents of the 10 appendices. The second two major sections are organized much more efficiently around the mechanisms influencing performance (mostly physical processes and plant processes) rather than highlighting what is occurring in each STA individually, as done previously. The use of metric units exclusively is not universal, but improved (leaving mostly the hydrologic parameters in English units) and, in general, the quality of the figures and use of references is improved. Exceptions are noted specifically below. One suggestion for improvement would be to change the name of the "Introduction" section to "Abstract" and with small modification put it prior to the "Summary" section.

The panel is especially pleased to note that after many years of requests the Report now contains an introductory section defining acronyms and that many of those used in this chapter are in it! Having this section at ones fingertips makes reading of the chapter far easier. However, many of the acronyms used in this chapter are still missing (a work in progress). Specific omissions are *not* noted below, but an electronic cross referencing to be sure all acronyms are in the listing would be a relatively easy editorial exercise that is yet to be performed.

Overall, the improvements to the structure of the chapter are impressive.

Q5: Are findings linked to management goals and objectives?
The answer to this question is a qualitative "yes". The panel believes that the document does a good job of explaining how and why the STAs are operated and how overall operations are varied in response to natural and anthropomorphic changes to keep then in, or close to compliance. The performance and vegetation sections are, in general, directed toward these explanations and are effective. However, much of the document, primarily the Performance Assessment section, but also the Vegetation section, describes completed and continuing research findings and, in general,

the descriptions tend to miss the reasons why the specific research programs are being conducted and how the results could be used to meet management goals and objectives. The fix to this is not difficult; a few sentences describing the problem the research addresses and what operations have, or might change based on the results would tie the individual sections to goals and objectives very clearly. This comment was made in last year's review as well which stated, "A sentence or two (or for more important programs a full paragraph) explaining the need for the research at the beginning of each specific research program discussed would provide a much stronger link between anticipated findings and the District's goals. A better job could be done linking the many studies reported here to management objectives."

Specific topics that could be better addressed include but are not limited to:

- The PSTA study. It looks as if the PSTA cells run by the Corps are outperforming even the SAV cells this year; the first year in which flow rate were sufficient to make comparisons. If this trend continues what might the district do with this information?

- What will all the data being collected from the soils studies be used for? Perhaps these data will help better understand some of the removal mechanisms, but what *management decisions* could be altered if this mechanism proves important (or unimportant)? Ultimately the District is charged with removing P, not basic scientific inquiry.

- Continuing data seems to suggest that the SAV cells do outperform the EAV cells for P removal, but this is counterbalanced by the obvious need for increased maintenance and tighter operational controls to keep SAV cells operational. Has the District done anything to weigh the costs versus benefits for continuing conversion of EAV to SAV cells? For that matter what is the desired ration of EAV to SAV in the current plan?

- What is the goal of the correction of flow measurement anomalies? Is it to replace hydraulic models for estimating flow with observed data. If so, what are the new CFD models being used for?

Specific comments questions by line number.

293-323: Especially since several of the STAs are deemed to be out of compliance of the interim effluent requirements for P, more information on how these interim requirements are determined should be provided. Clearly the three phases have an impact, but what about factors listed on lines 313-316? This is related to the comment under Q4 above.

306-307: When are operational curve requirements for STA3/4 anticipated?

350-365 (and associated Figure 5-6): More explanation as to how the 12-month rolling outflow TP concentration is calculated is warranted. Presumably the data points represent a 12 month average of TP concentration centered on the month plotted on the x-axis, therefore the labels on the x-axis are very confusing as they should represent individual months. Regardless, a rolling average is designed to smooth out variable data so the sharp breaks shown on all plots are odd, suggesting that the data do not represent the rolling average desired. Additionally, more information on the significance of Figure 5-7.

435: hydrilla responses….to what?

733-741: Must these data be reported for each outflow structure to meet compliance criteria? Probably so, but it would be instructive to note the FWM DO concentrations for comparison. This emphasizes that the structures out of compliance are typically low flows and the average effluent concentration is (likely) about the SSAC average concentration, bolstering the argument that the environmental consequences are not extreme.

756-797: It would be instructive to put a few introductory sentences (and/or another sub-heading indicating the these statements are an attempt to determine if the gates discharging DO concentrations less that SSAC are having an impact on the DO levels of the receiving waters. The comment above could be moved into this section. Also note the comment for Figure 5-9.

1051-1065 (and Figure5-12): It is curious that TP would increase significantly between the outflows of cells 5 and 7 and the inflow to cell 6. This curious condition should be addressed. Error analysis could shed light on this.

1106-1118: Do not put too much emphasis on transect to transect variation of values, especially for transect I which appears to be the average of just two grab samples. Rather focus on the overall trends which appear reasonably consistent across various flow paths of STAs 1 and 2; specifically an increase in TP at the beginning and then a gradual decrease.

1266-1299: This entire section on the soil characterization, but especially this opening sub-section, is not a strong as other sections in the chapter. Scientific comments for the whole section are provided in the next paragraph. These comments focus general editing of the entire section and technical comments on these first lines. The entire section could use significant general editing, and several suggestions are made in the editorial comments below. In addition, the entire section is relatively hard to read because the figures and tables are not placed on the next available page after they are introduced in the text. These are easy editorial fixes however. More concerning is that many of the statements are not supported by the evidence presented, or the meaning of what was intended is not clear. For example what is meant by inherent errors? (line 1292), deposition from biomass? (line 1294) and how do the factors listed on lines 1294-1297 influence the discrepancy between soil phosphorous and retained P. In fact it is not at all clear why one would expect a correlation, since soil P represents a pool that includes not only recently sequestered P but historically sequestered P as well. As mentioned the turnover soil P due to plant uptake and subsequent die offs and the mineralization of floc bound P to soil P keep these pools in non-steady condition with various flux rates that will never be easy to quantify. Based on these arguments it seem highly unlikely that a correlation between soil/floc bound P and retain ed P will be ascertainable. Further the utility of a strong correlation between mass of P stored in the floc and STA size is intuitive (bigger surface has more floc). Now if the mass P *per unit area* increases or decreases with size, that is a more meaningful result as it indicates rates of P removal vary with size. Currently Figure 5-29 presents the obvious.

1266-1528: Soil characterization has clearly been a focus of the District's research plan in recent years and this year the Chapter provides more detail on these results. The quantity of collected data is quite impressive and in general the plots and table effectively give an overview of the results. However no real analysis of these data is presented. There is great potential to cross correlate many of the presented data that might well elucidate performance-predictive relationships. Statistical correlations and modeling are probably required. What is the District's plan to correlate these data with performance especially in light of the brief comments made above on the fluxes between storage compartments?

1542: It is more appropriate to wait until next year's report to present the new topographical data for STA1W, rather than adding new information between the draft and final versions of this year's chapter

1545-1546: It is understandable to avoid submerged roads and ditches etc when trying to get an overall picture of the general topography. Yet, these features may be some of the most important when trying to assess causes of short circuiting flows, vegetation variation etc, so completely ignore them loses pertinent data. The District should look for alternative topographical and vegetation survey methods to refine the data (see Q4 suggested studies).

1626-1629: These two sentences are conflicting; how could there simultaneously be "extreme water level conditions" and "remained around the target stage"?

1695-1770: The description of the vegetation surveys could be better addressed if the presentation is divided into EAV cells then SAV cells. This could still be STA by STA (as currently presented) or better have a gross heading of EAV cells followed by SAV cells then divie by STA. The advantage here that the concerns and need for these studies could be more clearly stated. For example two big concerns appear to EAV invasion into SAV cells and lack of vegetative colonization due to excessive water depth due to topographical variation. However since the current technique cannot distinguish SAV form open water, the second concern really can be addressed in SAV cells. This could be brought to the fore with a restructuring of this section.

2051-2080: Though it is stated in the Summary section the increase in overall and effective area of the STA when compartment s B and C go on-line would be useful here.

Figure and table comments:

Table 5-1, Comment e: the words "and the" are repeated

Table5-2, line 2 under STA-1E row: Values should be reported with consistent significant figures i.e. without decimals

Figure 5-6: See the comments for lines 350-365

Figure5-7: What is being plotted here is very difficult to determine. The legend implies load divided by either flow or rainfall, but this probably not the case. Additionally the caption and axis labels should be more descriptive such as "Flow Volume" and "Annual TP Load".

Figure 5-9:The shaded regions are so light to virtually illegible. Please identify all components of the box and whisker lines and notches, not just the 95% confidence level. Most importantly the intent of this plot is not clear. Is there some intent to show a spatial relationship of these data. e.g. down a transect? The text associated with this (lines 756-797) is hard to follow.

Figure 5-10: Identify the sampling locations of figure 5-12 on this figure.

Figure 5-11: The arrow described in the caption is missing in the figure.

Figures5-16 and 5-18. The captions are missing the description of the arrows found on similar preceding figures, e.g. 5-11.

Figure 5-22: The arrows that should be on panel a (top) are missing.

Figure5-27: The axis label for panel C is missing.

Figure 5-28: Please organize the order of the STA in some logical manner. Presumably the asterisk indicates that data for STA 6 is from 2004 and not 2007. Caption should be consistent.

Figures 5-30, 5-33, 5-35, 5-36, 5-37, 5-38: Apparently the northwest corner of cell 2 was not sampled in 2009 and therefore 2007 data is substituted for all the reported parameters. Considering that there were obvious differences in most of these reported parameters between the two years, how were these data incorporated without introducing bias into the results? It would seem more appropriate to leave these data missing and use only the data collected in 2009. At the least, and expalana tion of why and how this was done should be included the text of this section, but no mention is made. Also, the wording of figure captions should be consistent between these figures (Fig. 5-30 is different) and all captions should indicate that data are collected from STA2.

Figure 5-34: see line 1468 editorial changes

Table 5-17: The units on the data are not provided. One assumes it is elevation and therefore a better overall heading is simply "elevation rather than "Survey Points".

Figure5-49: This figure demonstrates the impressive quantity of maintenance required to keep the STA operational. A better description (especially as to the order of operations) would help better demonstrate the process however.

Figure5-52: It is difficult to distinguish the lines in this figure. Might be better to use color in this one.

Editorial comments by line number:
Note: Suggested changes are made using MS Word Track Changes Mode so that authors can clearly see the additions and deletions to the text, or questions are placed as comments. We hope this clarifies the editorial comments and makes incorporation of the changes easier for the authors.

45 • During WY2010, the six STAs received a total of 1.39 million ac-ft of water excluding rainfall,

136 Data gathered help in further understanding STA performance and the underlying mechanisms as well as

270-272: The following ~~chapter~~ section summarizes STA performance, construction, operation and maintenance, research, and optimization efforts during Water Year 2010 (WY2010) (May 1, 2009–April 30, 2010). This ~~chapter~~ section fulfills various permit reporting mandates and

294: phased implementation schedule (**Table 5-4**). As part of the permit compliance for phosphorus,

329: In WY2010, all the STAs ~~demonstrated a reduction in~~ removed a significant fraction of the inflow TP loads, ranging from 60 to 86

396: STA sections ~~in this table~~ below for details). Many of the cells that dried out in previous years exhibited

~~446-447: failures~~
(S-375, S-365A, and S-365B) resulting in limited movement of water, historical overloading

461: accumulated on the water surface, in the outflow canals, and upstream of the outflow structures for about

514: the flux of TP in Cell 1 upon rehydration after dry conditions during the drought months, vegetation

519: below the maximum operational envelope; and inflow volumes were 1 percent above ~~of~~ the

533: and hydrilla biomass piled up on the first vegetation strip near the inflow. The uprooted hydrilla

637: under Section 62-302.530, F.A.C., states that measured values shall not be more than "29 NTUs above

651: the STAs, including excursion analysis, are summarized in **Table 5-7**~~8~~. In addition, the annual

658-659: outflows to the STAs, all the annual ~~mean~~ FWM concentrations measured at the outflows of each STA did not exceed the Class III criteria and were lower than annual ~~mean~~ FWM concentrations

816: sampled STAs demonstrated a reduction in fish ~~collections~~ Hg concentrations since 2008. There was an increase for

819: percent decrease. For largemouth bass (*Micropterus salmoides*), all STAs showed a Hg concentration decrease in

912-913: Everglade snail kites (*Rostrhamus sociabilis*) were first observed nesting over STA-5 and STA-3/4 demonstrating nesting behavior in late March 2010 (Kitchens, 2010). *Note: meaning of this sentence is not clear, please re-word.*

1039: STA performance, which can be used to identify areas ~~for improving~~ in need of improved vegetative communities or

1049: calculated using the following equations: PP = TP - TSP and DOP = TSP – SRP.

1099-1100: was performed in May 2009, nine days after rehydration of the cell, following a 7.5-month dry period during drydown of some portions [Comment: Something is wrong with the wording here]. The second was performed in August 2009, after a

1107: species concentration profiles. The TP concentration at a location adjacent to the inflow culverts

1269-1270: biomass. Characterization of the soil condition and understanding of phosphorus storage mechanisms are important ~~in~~to better understanding of the phosphorus retention of each cell. Temporal changes in bulk density

1289-1292: A comparison of the calculated SPS+FPS values with retained TP values (based on inflow-outflow water TP loading results), shows a big discrepancyies between the two values,, in which calculated SPS+FPS values are four to ten times greater than retained TP results calculated from the difference between inflow and outflow water P loads (**Table 5-16**). Aside from inherent errors

1294: deposition from biomass [Comment: What does this mean?] on the floc and soil surface, as plants uptake P from subsurface soil

1328-1329: event. Cell 3 floc TP concentrations also increased by less than 50 mg/kg compared to 2007, at a much lower rate much less than in cells 1 and 2, for an approximate increase of less than 50 mg/kg compared to 2007. There was little to no change in TP

1332-1333: There was a notable increase in floc P storage in EAV cells 1 and 2 between 2003 and 2007, while the trend between 2007 and 2009 was reversed between 2007 and 2009 (**Figure 5-32**). This is likely a result of higher

1349-1351: years. Mineralization and flux of P, as well as increased P content of cattails likely resulted in reduced storage in the EAV cell soils. Historical data is being analyzed further to better understand the TP removal mechanisms and differences in mechanisms and responses among STAs and between EAV

1371: consolidated as a result of dryout, and that observations of the 2009 sampling observations was represent freshly formed

1468: to 2009. anThe EAV cell that experienced repeated cycles of dry and reflooded conditions

1621: recovery during periods of low to no flow, but levels spiked up again during March and April

1625: **Water Levels at STA-1E and STA-1W**

2012: flows, detect and correct anomalous in flow data, and estimate missing data. AutoCAD

PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2011 SFER – VOLUME I, CHAPTER 6

Level of Panel Review: Technical (primary); Integrative (secondary)
Reviewers: J. Burkholder (AA), J. Burger (A), P. Dillon (A)

Posted: 09/15/10 at 01:38 PM by J. Burkholder

The level of review for Chapter 6 remains primarily technical because its emphasis is on research. The secondary review as integrative is also appropriate, since the ecology of the EPA affects or is affected by many of the other units (Lake Okeechobee and, indirectly, the Kissimmee basin, STAs, some of the Southern Estuaries, etc.). The overall nature of the chapter is not expected to change within the next five to ten years because many basic research questions about the ecology of the Everglades ecosystem remain to be answered.

Questions

Wildlife Ecology –

Is sufficient information known yet on breeding of Burmese pythons to develop methods for control?

Plant Ecology -

The authors recommend (p.6-36) further analysis of tree island topographic conditions to determine the specific hydrologic conditions that indicate higher risk of Old World climbing fern invasions. The panel supports this recommendation because, as the authors noted, identification of the specific hydrologic conditions that encourage the establishment of this invasive species will be important in guiding Everglades restoration efforts. Are there plans to consider elevation in further work to substantiate the hypothesis that the spread of Old World climbing fern is encouraged by drier hydrologic conditions on tree islands? This seems to be a very critical aspect of protecting tree islands in the future.

Sap flow is being examined as a potential index of tree island health. As the authors stated (p.6-40), the species included in the described study are considered to be relatively flood-tolerant in comparison to upland hummock tree island species. Are there plans to expand this study to other flood-tolerant species, and to abundant upland hummock species?

The subsection, Relevance to Water Management identifies critical data gaps (frequency thresholds for high and low water events, needed to constrain the number and duration of extreme floods and droughts). Are there plans to extend this study in order to obtain that information?

Ecosystems Ecology –

The authors point out (p.6-66) that in other systems, charaleans have been found to be a preferred food source for herbivorous wading birds, and that, in comparison to other macrophytes, they support higher abundance of invertebrates. Are plans being developed to assess the role of charaleans in Everglades nutrient cycling, aquatic food webs, higher trophic levels, and CERP restoration success?

Landscape Ecology -

The authors recommend (p.6-77) further study and analysis to correlate the findings from the mapping study to other metrics such as hydrology and topography. Are such studies/analyses planned?

In the ghost tree island study, eight ghost tree islands were compared to one live tree island and one transitional island. It would seem that the study design would have been stronger if more live tree islands and transitional islands had been included. Why was this not done? Are additional or extended studies planned?

The assessment of climate gradients across South Florida included identified additional efforts needed to assist the District in restoration efforts, such as downsizing coarse spatial-scale global circulation models and developing predictive climatic indices across an appropriate range of scales. Are such efforts planned?

General comments

Chapter 6 has improved greatly over the past three years; it is now much easier to follow, and the projects are much better integrated. The writing generally is excellent in general technical quality. The chapter focuses on four main areas in describing the ecology of the Everglades Protection Area (EPA), as wildlife ecology, plant ecology, ecosystem ecology, and landscape processes. Again, the large research programs addressing the ecology of the EPA were presented so that overall hypotheses and objectives of the described studies were clear, linked to descriptions across the chapter, and clearly linked to management and restoration goals as well. There is an immense amount of technical material outlined in this chapter; in general it is very informative, the research and monitoring is well executed and reasonably interpreted, and the overall program seems comprehensive and thorough.

This year's chapter's expanded Summary section provided an excellent synopsis of District progress across a remarkable breadth of activities, including a nice integration of these activities. The chapter, organized by Fred Sklar and his editorial team, was a pleasure to read because it was well written and well-founded in science. Major recommendations in last year's review stressed that Chapter 6 should be more strongly integrated with other District efforts by including more cross-referencing to other chapters, and more internally integrated across the EPA research projects; that the Summary section should briefly convey how

the various subsections are being integrated; an overall Conclusions section should be added to integrate major findings and interpret how they will guide future efforts; and, in general, a strengthening of the detail in this chapter sufficient to enable scientific evaluation of the various studies that were described. These recommendations all were carefully considered and addressed by the authors. As another significant improvement that makes this chapter even stronger than last year's, the relevance of each project to District goals is succinctly, clearly described. The authors also added clear recommendations for further efforts where appropriate, such as recommendations for continued research, monitoring, and management efforts

regarding 12 identified priority invasive taxa in the Greater Everglades.

Technical Review

Technical review is appropriate for this chapter because there is a major research component and new data are being analyzed for unique interpretation. The District's guidance on technical review has been that methodological details should continue to be reported along with explanations of new findings, and that the following questions should be considered in the evaluation:

▪ Are the findings and conclusions supported by "best available information", or are there gaps or flaws in the information presented?

▪ Are there other interpretations of the data and other available information that should be considered by the authors and presented to decision makers? If so, what specific studies should be addressed or what available data support alternative findings?

This chapter, as last year's, is generally outstanding in conception, content, and technical merit, but is improved even over last year's excellent effort. The findings and interpretations are sound, and generally supported by the best available information. Whereas last year's chapter suffered in places from writing that was too brief to enable scientific evaluation of the work, this year's Chapter 6 succinctly included sufficient information to enable scientific evaluation of the many studies that were described, including hypotheses where appropriate, clear methods, summarized statistical analyses of the data, and wellfounded interpretations. One general suggestion to improve the writing is that, in various places throughout the chapter, it seems that the data are reported with too many significant figures, and should be adjusted. For example (Lines 407-408), technically, stating that the number of wading birds was "approximately 21,426" means that the number was between 21,425.5 and 21,426.5. The number of significant figures used indicates the precision, and should be reported accordingly (21,400? 21,000? – the authors know the specifics of how precisely these counts were made, and the values reported should reflect this, here and throughout the chapter). As another example, the panel questions whether eight significant figures should be attributed to some of the measurements in Table 6-14. The chapter should be checked throughout to correct this problem.

Hydrologic Patterns

As in previous years, this consistently excellent section sets the stage for what happened in the WCAs and Northeast Shark River Slough (especially to wading birds) in WY2010. The figures, complete with redyellow- green indicators for foraging conditions, provide clear comparative information about tree islands and peat conservation as well as foraging conditions for wading birds. Obviously, the relationship between water level recession rate and wading bird foraging is finely balanced. Inclusion of the previous year's data for comparison was very helpful; in future SFERs, a brief discussion of the findings compared with longer-term patterns would also be useful. The beginning paragraph was clear, concise, and provided an overall understanding of the precipitation patterns, as did Table 6.2. The use of labels (p.6-9, lines 191- 214) to indicate relative conditions is extremely important, and is an improvement in providing information that will be readily available to a wide range of stakeholders. The consistent use of this method throughout the writing provides a nice comparison among sites. The panel strongly encourages the study recommended by the authors (p.6-11, lines 244-246) to more closely examine hydropatterns in WCA-2A to strengthen efforts to restore tree islands.

Other comments:

P.6-8 - It would be helpful to include a regional map in this first section for those unfamiliar with the geography (and terminology), showing the locations of WCA-1, WCA-2 etc.

P.8 etc. - Please check to ensure that metric units are included as well as English units (e.g. acre-feet) here and throughout the chapter.

Wildlife Ecology

This section begins with a helpful synopsis of the major effects of human alterations in the EPA on colonially nesting wading birds, and explains the District's efforts both to document the key factors that influence wading bird reproduction and to develop "practical spatially explicit tools" to predict foraging and nesting response to changing environmental conditions. Lines 340-348

present a good summary of overall trends, and an important aspect of each subsection. It might be useful to add some dates to the trends description. Lines 353-355 describes the District's broad focus in its research on wildlife ecology, and it would seem fitting to highlight the role of temperature among other factors mentioned, since this breeding season was excessively cold. The description of wading bird populations, the general failure of nesting success in WY2010, and the underlying factors that contributed to this failure is sufficiently detailed and clear. Lines 364-399 provide a good statement of the objectives and goals, but it would be helpful to reference the documents that set these goals. In line 404, it was not clear as to whether the authors are considering the cattle egret to be an invasive species, although it arrived naturally(?). Ultimately, this species may be a good assessment endpoint. Table 6-4 suggests that snowy egrets are 'in trouble' in a number of locations; this may be a regional rather than Everglades problem.

The subsection beginning on p.6-22 presents interesting data but its title highlights phosphorus cycling, so additional explanation is needed to help readers. The authors (p.6-22, line 477) state that nitrogen (N) and phosphorus (P) are closely linked in food webs, but this is sometimes not so straightforward. Additional writing is needed to support this premise for tree islands, for example, by including more information about N and P inputs from guano. To help readers, the authors should also more clearly state that the lack of stable isotopes for P prevents a parallel analysis of this nutrient. Supporting literature citations should also be added for the information on p.6-22, lines 477-490. This is an extremely important project, as it addresses the mechanisms of how the Everglades habitats can change as a direct result of wading birds and other fauna. The authors should add explanation (lines 526-527) as to how bird (or other animal) use varies on different areas of the tree islands; can more information be provided as to whether the variation in soil del-^{15}N values due to animal excreta or bird excreta? (The authors should also check the reference, McColl and Burger, 1976, *American Midland Naturalist* 96: 270-280.)

The "stable isotope study" subsection concludes with a succinct, nice explanation of the relevance of these findings to water management. The panel supports the authors' recommendation that additional data should be collected to improve understanding about the relative contribution of wading bird guano to P [and N] enrichment on tree islands, and the role of wading birds in maintaining tree island productivity. However, the authors should broaden their scope to track TN concentrations (along with del N values; or both urea and ammonia concentrations) as well as P concentrations.

The subsection on invasive nonindigenous species is a well-justified, excellent addition to Chapter 6, complete with strong supporting references, based upon the authors' apt point (p.6-2) that consideration of Everglades wildlife now must include exotic invasive species. Previously, readers largely were referred to Chapter 9 for information on this important topic; this year's Chapter 6 appropriately assessed five invasive plant species (Australian pine, Brazilian pepper, melaleuca, Old World climbing fern, and shoebutton ardisia) and seven invasive animal species (Argentine black and white tegu, Cuban treefrog, Burmese python, island apple snail, Nile monitor, redbay ambrosia beetle, and sacred ibis) because they strongly influence EPA wildlife ecology. The overall approach for the invasive species subsection provides consistency in considerations about each of the species. The inclusion of animals as well as plants accomplishes an ecosystem approach. The individual species accounts are clear and present the problems in a way that is readily understood by the public and policy makers. This subsection includes, for each of 12 priority species, excellent objectives, a very helpful description of the general biology of the species, its distribution and its threat, a prognosis for restoration impacts, and recommendations to mitigate these impacts. The panel strongly supports the authors' carefully conceived recommendations about these species with respect to continued control actions and research needs. Completion of these recommendations will significantly reduce the threat that these invasive species pose to the District's restoration efforts in the EPA.

Some specific comments:

Lines 464+ - It would be helpful to define head, near tail, and far tail when these terms are first mentioned.

P.24, Table 6-5 - The chemical analyses suggest that at 2 of the 3 sites, the upper 30 cm of "soil" is ~4% P, which is probably comparable to ~pure guano.

Lines 541- 556 - It seems certain that the bird guano and wildlife excreta greatly enrich the tree islands. Whether this is relevant to the overall P budget is another issue, and resolution of this issue would require estimates of tree island area, numbers of wading birds, and the chemical content of guano.

Line 597 - Calls for continued funding for systematic control in remaining impacted areas; in support of this recommendation, please add information about the extent of the remaining problem.

Line 760 - Describes mortality of Burmese pythons related to cold temperatures. Clarify whether the mortality was also age-related.

Line 769 - Describes mortality of nesting birds from predation by giant constrictor snakes. Add information as to whether there are plans to develop methods to reduce this problem (e.g. through habitat modification or other deterrents).

Lines 775-776 - Control programs seem to be most important at this point. Clarify whether there is any way to stop northward spread.

Line 803 - Suggests that Nile monitors cause problems for alligator nests and eggs. Combined with potential problems from giant constrictor snakes, these animals may present a dual threat to alligators (at least young stages). Please clarify whether this is the case.

Line 841 - Add information about how extensive this species is in number and distribution within the Everglades.

Plant Ecology

This section focused on three studies of tree islands: (i) surveys used to identify early infestations of the invasive species, Old World climbing fern (*Lycopodium microphyllum*); (ii) use of sap flow as an ecophysiological (stress) indictor of woody species responses to changing hydrology on tree islands; and (iii) seedling and sapling recruitment of selected woody tree species as influenced by hydrology and soil nutrients.

The survey of *L. microphyllum* was scientifically sound with appropriate statistical analyses, but that the objectives of this project and analysis need to be more clearly stated in the beginning of this subsection. The study is described as simply identifying Lycopodium; explanation should also be added about how the findings will be useful for management/restoration. (Remedying the hydrologic problems should contribute significantly to reducing habitat for Lycopodium in tree island restoration efforts.) An important finding of this study was that adjacency to other infested areas did not predict the presence of this invasive species on tree islands in WCA-3A or WCA-3B. Instead, it appears that hydrology controls the spread of this species, so that tree islands in areas with drier conditions are more conducive to its colonization.

In contrast to the description of the Lycopodium study, the sap flow study clearly stated the objectives and rationale. It was conducted to improve understanding about optimal hydrologic requirements of dominant woody tree species on tree islands. The study compared seasonal and spatial data from a strong dataset – collected with remarkable frequency (based on data taken at 1-minute intervals for nearly a year) – for three abundant woody tree species (deciduous willow *Salix caroliniana*, semi-deciduous pond apple *Annona glabra*, and evergreen cocoplum *Chrysobalanus icaco*) in different hydrological conditions on a tree island in WCA-3A. The data indicated that sap flow rates are sensitive to water depth and the extent of inundation, so that this variable shows promise for development as an index of tree island health.

The third study seemed more preliminary in nature than the others; thus far, sap flow appears to be a useful method for evaluating stress. Thus, the authors' interpretations (p.6-44) were aptly presented with caution, although thus far the data support their hypotheses that survival of woody tree species seedlings and saplings is driven by hydropattern. This subsection would benefit from additional information and explanation: The authors (lines 1176-1181) should include a summary of the TN concentrations along with the TP concentrations, and they should add brief explanation about the high TP (and TN?) in the head region relative to the tail region of tree island 3AS2. They should also explain why the two tree islands selected were so different (one with clear hydrologic differences between head and tail, versus the other with a long hydroperiod throughout). The Results subsection should provide information about the apparent importance of small elevated sites, which is invoked in the Conclusions.

Other specific comments:

Lines 930-939 - The authors should add information about the general size (area) of the tree islands included in this survey so that readers can evaluate whether the grid size for the hydrologic data in EDEN (400 m x 400 m) is sufficiently small to enable the detail needed to accurately assess hydrologic conditions.

Lines 972-988 - These two subsections are excellent and put the preceding text in context (some of this writing would have been helpful earlier).

Line 1044 - Clarify whether this diurnal pattern was the same regardless of temperature or seasonality.

Line 1098 - The writing seems to suggest that saplings differ from adult woody species in the pattern of sap flow; if this is so, it should be explained along with the implications.

Line 1117 - Please clarify whether this refers to long hydroperiods or low-water hydroperiods.

Line 1147 - The previous information showed that sap flow was involved, and that should be mentioned.

Lines 1218+ - Should mention whether absolute water level also matters.

Line 1234 - Effects on survival, as well as germination, should also be mentioned.

Ecosystem Ecology

This section focused on two projects that examined mechanisms to accelerate the recovery of cattail infested marsh, and a third project that assessed the utility of plant fossil seeds to determine historic hydrologic regimes. It described development of a wetland ecosystem model (WEM) and results from simulations of five combinations of hydrologic and seasonal scenarios. Fire is clearly an important ecosystem process within the Everglades, and the focus on this aspect is critical and key. In addition, an update on the Cattail Habitat Improvement Project (CHIP) was provided, emphasizing wildlife and ecosystem functional responses to removal of cattail using herbicides. Finally, the section addressed the important issue of climate change through an analysis of soil cores' geological record from seed macrofossils and charalean oospore microfossils to quantify changes in EPA vegetation at scales ranging from multiple centuries to millennia. The goal of the modeling effort was to identify the best fire scenario to reduce P storage. The Cattail Fire Model or WEM and the simulations from it (methods, objectives, hypotheses, etc.) were described in some of the nicest writing of this chapter. This model is a valuable addition; although fairly complicated (Figure 6-17), adequate data apparently are available to calibrate it. Thus far, the model has enabled evaluation of the effects of single versus multiple fires on phosphorus dynamics, based on data from four years, including two fires, in a highly P-enriched plot versus a moderately P-enriched plot in WCA-2A. The model output was/will be used to improve understanding about the effects of longer-term application of repeated fires on cattail recovery and phosphorus (P) release. The simulations supported the

hypothesis that repeated application of prescribed fires, especially in late summer at low water depths (< 10 cm) remove more P from the ecosystem and reduce P storage. This model has the potential to greatly affect management with respect to fire, and additional data will no-doubt refine the model. One suggestion for this subsection is to clarify, in the results and discussion, measured results versus model simulations. The overall goal of the CHIP is to accelerate restoration of P-enriched, emergent macrophyte marshes in the Everglades. In this year's effort, preliminary findings indicate that relative to the control (closed) areas, openings in emergent vegetation that were created by herbicides have higher available light, higher temperatures and wind speed, more submersed aquatic vegetation, more periphyton, less total carbon in the floc layer, and higher dissolved oxygen and pH (especially evident in comparison of diel cycles). The authors' interpretation from these data in combination with previously reported information on foraging wading birds and fish biomass is that wildlife diversity and are sustainable in the short term in the opened areas, and likely can be sustained in the long term with minimal effort and cost. However, actual reductions in surface water P and soil P levels were not observed over the four-year period of data collection, attributed to the fact (line 1574) that the established open regime is "in its infancy." Information should be added about plans to continue to track conditions in these plots.

The third study in this section was justified on the basis that a key goal for CERP is the restoration of ecosystem attributes characteristic of the historic ridge-and-slough landscape of the Everglades; that accomplishment of this goal requires accurate information on historic vegetation and, by inference, hydrologic conditions; and that paleoecological studies also provide important information about ecosystem response to climate change, a looming issue for South Florida's ecosystems and the District's restoration efforts. The study is in keeping with classic palynology, and well done, including soundly executed dating techniques. The preliminary findings are nicely supported by the evidence presented: The paleo data thus far from three soil cores taken from ridge-and-slough areas indicate that historic major ecosystem state changes in the EPA were driven by multi-decadal droughts; and that natural climatic changes (specifically, pronounced southward shifts in the Inter-Tropical Convergence Zone) caused a change from ridges and sloughs dominated by sawgrass and water lilies to a fire-controlled system dominated by tree islands and charaleans. The study is well-referenced and, in general, clearly presented. It is a novel approach, and one that might yield significant results. The authors also nicely describe (p.6-65) an example of remaining discrepancies, and include a plausible underlying mechanism. The link with fires (p.6-66, line 1757) is both interesting and corroborative.

Specific comments:

Line 1276 - Clarify whether the fauna are being monitored as well.

Line 1436 - It seems that another objective is to determine the optimal size of the patch; if so, please add.

P.6-53, Methods section - Brief background information about glyphosate and imazpyr should be added (the toxicities of these substances to non-target species, other effects that might result from their application, and work that has been done to assess these issues). This information would remind readers (given that previous SFERs have addressed these issues) that potential adverse effects of the chemicals on non-target species have not been overlooked.

Line 1551 - Briefly explain whether the shape of the plots influences the development and patch dynamics.

Lines 1554-1561 - The authors should mention whether the relative effects of these changes on mercury levels or methylation have been examined.

Landscape Ecology

District efforts in WY 2010 focused on five major landscape-scale projects, which are clearly described, scientifically sound, and well-justified, except that for projects i-iii, the "Relevance…" subsections need to be strengthened.

i) Characterization of "ghost" tree islands in Water Conservation Area (WCA)-2A - Ghost tree islands are defined (p.6-67) as tree islands that have lost elevation and most of their woody vegetation. They are detected only as scars in aerial photos, and sparse information is available about them. Based on what appears to have been exhaustive work, the ghost tree islands studied were found to have low plant diversity, with vegetation consisting mostly of a few woody species at the heads and sawgrass in the middle and tail regions. The importance of tree islands to the biodiversity of the region is clearly conveyed in this subsection. However, the overall objectives of this important study and the rationale/links to management need to be more clearly presented. A critical aspect would appear to be the comparison of tree islands with ghost islands and the conditions immediately surrounding both (hydrology etc.), but this is not clear from the writing. Finally, it would be helpful for the authors to clarify whether this valuable work will be extended as part of an ongoing monitoring program.

ii) Updated maps of tree islands in WCA-3A/3B covering the period from 1996-2004, based on aerial photos

- This study will continue to enable evaluation of historic trends and strengthened insights about the main hydrologic characteristics needed for tree island restoration and successful implementation of the Decompartmentalization and Sheet Flow Enhancement Project (DECOMP). The authors describe a disturbing decline in the number and overall area of tree islands in WCA-3A/B.

iii) Vegetation changes also indicated from the above mapping effort, based on an analysis of aerial photos taken in 2004 along with appropriate groundtruthing - Documented changes were described in vegetation types (sawgrass/ shrub, broadleaf marsh, floating marsh, and a disturbing, rapid cattail expansion). This section (e.g. Line 2050) also needs clearer explanation about the overall function of the mapping and how it will be used to help restoration. In the present writing, the function of this extremely important program is not clear until the Conclusions section.

iv) Application of the remote sensing technique, digital area sketch mapping (DASM), to assess the spatial extent and dominance of four priority invasive plant species (Australian pine, Brazilian pepper, melaleuca, and Old World climbing fern) – This section was very useful and informative, and could be better integrated with the invasive species information presented earlier in the chapter. The exciting technique, DASM, provides a lot of very useful data at relatively low cost and effort, and should be applicable to other/larger areas. Similar information for the other species will prove valuable in management, control, and public support for these programs. In many ways, invasive species have the potential to dramatically alter any RECOVER programs, and the emphasis on mapping is key.

v) *Landscape-scale analysis of climate in the EPA using major climate indices* - This analysis of climate regimes emphasized surface temperatures and precipitation. As the authors describe, this excellent effort represents a first step to help detect and interpret climatic influences on Everglades hydrology at spatial scales relevant to the District's water management efforts. Just as changes in hydrology over the Everglades are critical, climatic differences are as well, and this type of study will ultimately assist modeling efforts.

Integrative Review

This level of review should evaluate how well the chapter provides integrated summaries of information, and it can also evaluate cross-cutting themes and the connections between research

and water projects. Questions that have been recommended by the District for consideration in integrative review are:

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

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

▪ Can constructive criticism and guidance be contributed for the District's large-scale programs?

The information in this chapter relates to several other chapters, including water management, invasive species, and coastal estuarine ecosystems. This year's Chapter 6 has improved integration with other chapters. For example, the focus on invasive species in Chapter 6, and integration of this information with Chapter 9, is excellent, and the main aspects examined are of critical importance to restoration efforts. For future SFERs, some potential linkages among the various sections could be more clearly explored. As an example, could replacing cattails with submersed vegetation have an effect on nutrient and mercury cycling? This should be considered and examined. In addition, Chapter 6 would be strengthened by more clearly relating the overall ecology of the EPA to the coastal ecosystems.

This draft chapter also has improved integration across sections and projects, accomplished in part by including explanations about the relevance of each project to the District's restoration efforts. Some opportunities for improved integration remain: For example, in the Ecosystems Ecology section (p.6-66), the authors indicate the potential importance of charaleans in Everglades restoration efforts, information that is supported by the findings thus far from a CHIP study described a the previous subsection (e.g. p.6-58).

Subsections within each of the major sections generally were well integrated. Invasive species, a major problem that cuts across all of the ecosystem processes and all of the science and management efforts in which the District is engaged, were appropriately emphasized and integrated throughout the chapter while also recognizing (p.6-25) that this topic is addressed in a separate chapter (Chapter 9 and its Appendix).

Table 6-1 merits separate comments: This table provides an excellent, succinct framework overview of the topics covered, findings, and relevant mandates. Its contents make the important integrative point, reinforced throughout the chapter, that the described research projects are related to various operational mandates that are specifically identified. Table 6-1 also makes it possible for the authors of the other chapters to integrate the general ecological studies with the mandates of their chapters. Tables such as this strengthen the potential for integration across chapters, concepts, and projects.

The subsection, Climate Gradients Across South Florida (p.91+) is excellent and very relevant to

Everglades ecology, but seems out of place. It belongs within the Landscape Ecology section, but it might make more sense to lead this section – and, perhaps, to relocate this section near the first section on Hydrologic Patterns. It would be helpful for the chapter to include explanation of linkages between these two sections, rather than having them presented first and last.

CLIMATE GRADIENTS ACROSS SOUTH FLORIDA

Finally, the Conclusions, newly added this year, is an extremely important section and a valuable addition to integration among the ecological studies, as well as among the chapters. The interpretations are well supported by the evidence presented. One suggestion is that the effects of invasive species (including cattail) could be further integrated within the topics discussed. Further, some indication of the relative completion of different projects, their role in RECOVER, and management implications would be helpful.

Editorial / Other Content Changes

P.6-1 - The Summary should be altered to include a synopsis of the Hydrology section, and the main projects of the Ecosystem Ecology section should be more clearly described in the first paragraph.

P.6-1, line 18 - …direct effects of… P.6-2, line 38 - …Cuban treefrog…

P.6-1, line 19 - should mention when the cold weather occurred, and briefly describe the hydrological conditions that resulted in lowered success.

P.6-1, lines 21+ - it would be helpful to mention how the nutrient enrichment of tree islands affects the wildlife as well.

P.6-2, line 52 - the only ecophysiological measurement emphasized in this study was sap flow (which is used to estimate transpiration rate); therefore, the writing should be changed to: …description of an important ecophysiological measurement, sap low, of tree species…

P.6-2, line 69 - …wetland ecosystem model (WEM)… The Summary should include a brief synopsis of the important information on p.6-51 regarding cattail.

P.6-2, line 71 and P.6-52, line 1422 - conflicts with p.6-47 (five vs. four)

P.6-2, lines 76+ - the emphasis on mechanisms is important, and appreciated.

P.6-3, lines 84-85 ("Paleoecological analyses of Everglades soil cores used fossil pollen, diatoms, seeds, and other proxies…") - conflicts with p.6-60, line 1617 ("For the current study, analyses of soil macrofossils (mainly seeds and plant fragments…"). The Summary should be changed accordingly to emphasize macrofossils and charalean microfossils (oospores), while omitting mention of microfossils such as pollen and diatom frustules which were not addressed.

P.6-3, Landscape section - the first paragraph should more clearly identify the five projects (it seems more like four projects - suggest that #2 and #3 should be combined). The significance of the findings in #3 should be briefly explained, and the important finding about cattails should be added.

P.6-3, line 88 and P.6-66, lines 1759, 1769, 1775, 1778 - change charophyte (charophytes) to charalean (charaleans) (Graham et al. 2009, Algae, 2nd edition, Pearson Benjamin Cummings, San Francisco). There has been a change in the taxonomy; "charophytes" now refers to various algae in addition to *Chara*/*Nitella* etc., whereas the order Charales specifically refers to *Chara* and its close relatives.

P.6-3, line 89 - please clarify ("a conversion that is unprecedented…"); the meaning is not clear as written (Table 6-1, p.6-6, is much clearer on this topic).

P.6-3, lines 91-94 - it would be helpful to mention how these projects are related or lead to overall restoration of the Everglades.

P.6-6, Table 6-1 - the findings from the Cattail Fire Model (WEM) should more closely match those described in the text; in particular, missing from the table is the important overall finding that water depth was the most critical factor influencing the effects of fire on P removal, the post-fire P pulse, and downstream impacts.

P.6-7, Table 6-1 - the findings about Vegetative Trends do not match the Summary text, which makes no mention of the important finding about cattail cover since 1995. Please change for consistency and to improve readers' understanding.

P.6-8, line 181 - it would be helpful to state how wading birds were affected.

P.6-10, line 218 - …there were still… P.6-10, line 221 - …period; this was not…

P.6-10, line 234 - …season – not an… P.6-11, line 252 - rewrite to clarify meaning

P.6-13, Figure 6-4 - Shouldn't the December 2009 reversal should be indicated by a red arrow?

P.6-15, Figure 6-6 - it would be helpful to add red arrows showing the numerous reversals.

P.6-17, line 358 - it seems that the authors do not mean recasting the data but, rather, understanding the effects of different stressors(?).

P.6-17, line 362 - should also mention the seven priority invasive animal species.

P.6-18, line 402 - …which include Florida…

P.6-18, lines 404-405 - the reader is referred to a document that unfortunately is only in preparation and, therefore, would not appear to be available. Please alter the wording accordingly.

P.6-19, lines 418-421 - the description of this important overarching goal should be moved to the first page of this section.

P.6-19, lines 436+ - please clarify the evidence for weather being the cause of poor nesting success (reference the relevant reports or studies).

P.6-22, line 468 - Wetzel et al. (2009) is missing from the References list.

P.6-22, line 477 - please include supporting references for these studies.

P.6-23, line 513 - …organic pool. Therefore…

P.6-23, Figure 6-9 - please add information about N values in the legend; also clarify whether the bars indicate standard errors or standard deviations.

P.6-23, line 575 - …not have led to…

P.6-23, lines 515-518 - needs supporting references. Can information about herbivore droppings in tree island areas, or bear populations, be added as well?

P.6-23, line 522 - The data reveal a…

P.6-23, lines 522-531 - should use (parallel) past tense throughout.

P.6-25, line 569 - please add the supporting citation.

P.6-32, lines 862-863 - should include the name of the invasive species.

P.6-32, line 870 - move references to the end of the sentence.

P.6-37, line 1022 - …along the central axis of…

Lines 1096, 1264 - Sklar et al. (2010) is not in the References section (assumed to refer to the first section of this draft chapter after the summary?).

P.6-44, line 1229 - …where hydroperiods are

P.6-46, line 1288 and P.6-68, line 1833 - briefly explain why 30 cm as a cutoff.

P.6-46, lines 1299-1300 - briefly explain the rationale for this assumption, especially considering that the model was iterated for 50 years (line 1309).

P.6-46, line 1321 - please mention what the S3 simulation was, and why it is not presented here.

P.6-58, line 1541 - …the macroalga…

P.6-58, Figure 6-23 - should include separate information for *Chara* sp.

P.6-59, Figure 6-24 - more is needed in the legend to explain the colors/vegetation in the photos.

P.6-59, lines 1555-1561 - should be moved to the beginning of the CHIP section (p.6-52).

P.6-59, line 1573 - …given that the…

P.6-60, lines 1602, 1620 - explain "teleconnections" for readers.

P.6-60, line 1612 - …suggested that broad…

P.6-62, line 1664 - please briefly explain the rationale or basis for this assumption.

P.6-62, lines 1667-1668 - please also briefly explain why a constant rate of supply was assumed.

P.6-62, line 1673 vs. p.6-60, line 1607 (and p.6-66, line 1786, etc.) - conflict; one describes time scales of multiple centuries to millennia, whereas the other describes time scales of multiple decades to millennia

P.6-62, line 1675 - is the first place in the description of this study where soil age models are mentioned; they need to be described in the Methods.

P.6-65, line 1717 - …suggest that changes…

P.6-67, line 1823 - please briefly describe the size (area) range.

P.6-73, line 1950 - briefly explain how the size dimension of tree islands has changed following human alterations of the Everglades.

P.6-73, line 1958 - ….Enhancement Project (DECOMP)….

P.6-74 vs. p.6-77 - there is an abrupt change in the text from use of hectares to use of acres; should be altered for consistency (note: Table 6-12 includes a helpful presentation of data in both units)

P.6-87 - appears to describe findings from traditional groundtruthing methods, in conflict with p.6-85, lines 2204-2006.

PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2011 SFER – VOLUME I, CHAPTER 7

Level of Panel Review: Accountability (primary); Integrative (secondary)
Reviewers: R. Ward (AA) and J. Burkholder (A)

Posted: 09/16/10 at 10:30 PM by R. Ward

Chapter 7 provides a very brief annual update of large programs and initiatives being undertaken to improve water quality, water delivery timing, and water distribution to the Greater Everglades ecosystem. Chapter 7 emphasizes CERP (Comprehensive Everglades Restoration Plan), NEEPP (the Northern Everglades and Estuaries Protection Plan), and RECOVER (Restoration Coordination and Verification). This year's chapter mentions 18 and 20 projects in the Northern and Southern Everglades, respectively (Figures 7-1 and 7-2). There are three brief appendices as well (7-1, CERP Annual Report; 7-2, Northern Everglades Annual Work Plan for FY 2010; and 7-3, RECOVER Activities Update). Because this chapter is so "streamlined" (line 35), readers are referred to the *SFER Consolidated Project Report Database* website for further information, and to Volume 3 (Annual Permit Reports) of the 2011 SFER for details on permits. Appendix 7-3 also refers readers to the *2009 System Status Report* where regional information on ecosystem conditions is made available.

Chapter 7 is well organized and well written, and provides insight into the progress of programs and projects associated with restoration of the Greater Everglades area. The addition of web access to detailed project reporting and ecosystem status enhances the amount of information available for review.

Accountability Review

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

1. The data and findings presented in Chapter 7, as currently written, focus primarily on the progress of environmental restoration *projects* moving through a project management system – planning, acquisition, design, construction and contract completion (to operations). This information addresses the purpose of the Chapter to describe "…progress of environmental restoration projects and initiatives that occurred during Water Year 2010…" (lines 58-59).

2. An important emphasis of Chapter 7, however, is to attempt to describe the District's laudable, holistic approach to ecosystem restoration through advancing the Northern and Southern Everglades initiatives. This is a huge challenge, however, to capture in succinct writing. The authors wrote (lines 62-68) that "the projects and initiatives are designed to work together to benefit the Greater Everglades ecosystem." It is not possible, in reading this chapter, to get a sense of the main thrust of the projects or how they are meshed. Therefore, in addressing the above questions, this chapter does not seem to achieve a complete or appropriately explained overview of Everglades Restoration. The authors (line 58) note that the chapter aims to describe "progress of environmental restoration projects and initiatives that occurred during WY2010 and FY2010" across the Northern and Southern Everglades. Unfortunately, the writing is so brief in various places that it is difficult to determine whether progress has been made.

3. To further illustrate, the Chapter's *Introduction* contains, in lines 62-68, statements that describe, collectively, why restoration projects are being undertaken – to improve the quantity, quality, timing, and distribution of water in the Everglades ecosystem. The Chapter does not present a summary of data and findings related to status and trends in improvement in these attributes of the Everglades ecosystem. For example, why are no data and findings presented about restoring Greater Everglades flow conditions as a result of programs and projects being completed and becoming operational? There are references to other chapters and websites where scientific data and findings are reported on a regional and project-based basis, but Chapter 7 makes no effort to summarize these findings.

4. Appendix 7-3 introduces the *2009 System Status Report* link – a webpage that contains regional summaries of key environmental indicators. Are there plans for the chapter, in the future, to include a brief overview of *collective* project benefits to the Greater Everglades environment? Or will environmental benefits be measured on a project-by-project or regional basis and reported in other SFER chapters, as is the case now?

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

1. The synthesis of information (what there is of it) is presented in a logical manner, but the findings are mostly only vaguely linked to management goals and objectives.

2. The 2011 version of Chapter 7 is better organized than previous versions of the report in that the Chapters 7A and 7B of the past are eliminated in favor of a better organized single chapter.

3. The new title of Chapter 7, however, is not descriptive of its content. 'Everglades Restoration' could include topics from a number of other chapters, such as Chapters 2 and 3A. Chapter 7 addresses *project progress* involved in environmental restoration – not environmental restoration in all its dimensions. A more descriptive title for Chapter 7 would help readers approach its content with clear expectations.

Are findings linked to management goals and objectives?

1. The findings presented in Chapter 7 are linked to administrative/contractual accountability goals, but not, in the Chapter itself, to environmental goals. The text notes that scientific environmental findings are presented elsewhere in the report or can be obtained via links to databases. However, it is extremely difficult for readers to gain any understanding from the writing about the environmental benefits so far from the restoration initiatives and programs. Are there plans to incorporate Greater Everglades environmental accountability metrics into Chapter 7 to help future readers gain an overview of "…the cumulative regional environmental benefits as projects are implemented …" to improve the quantity, quality, timing, and distribution of water? (lines 67-68)

2. Along these lines, the last two recommendations listed in Appendix 7-3 (on page App.7-3-5) discuss system performance measures and evaluation methods, but it is unclear if these measures and methods address only administrative benefits or if they include environmental benefits resulting from the projects.

3. Chapter 8 notes, on page 8-8 that until "…projects have been implemented for a sufficient period of time, it is not possible to measure certain responses of the EPA to Long-Term Plan projects." The way Chapter 7 reads at present (i.e. little mention of environmental accountability), it seems to embed that same assumption regarding environmental accountability. A clarification of this point at the beginning of the chapter would be helpful.

4. Chapter 7 would benefit from additional wording to help readers understand the distinctions being made between program/project administrative accountability versus environmental accountability. In addition, explanation is needed about how environmental accountability will be handled in the future, as more and more of the projects are brought online.

Specific Comments

CERP – A total of 93 projects and components (undefined) were described as identified during the reporting period, and 27 of those were "actively being worked." Table 6 in Appendix 7-1-25, and the information contained on pp. 28-30, are very helpful in clarifying the status of these projects. It should be mentioned, however, that the mention of 93 projects and components seems confusing when compared to Appendix 7-1-13 (nearly 50 major projects and 68 project components); it would be helpful to clarify how many of the 93 projects were "major"? and what constitutes a "major" project?

Under "Highlights" (p.7-5), the authors should clarify how many acres of estimated lands were acquired in this reporting period. It would also be helpful to indicate whether the highlighted projects such as Merritt Pump Station construction and Phase II road and logging tram removal are proceeding well. The description of the CERP implementation process (Appendix 7-1-13) was helpful in this regard.

NEEPP – Readers are referred (lines 141-142) to Appendix 7-2 for next steps in restoration of the Northern Everglades region, which simply contains lists of construction projects, activities/rules under the Pollution Control Program, and activities/monitoring networks under the Research and

Water Quality Monitoring Program without further explanation. Explanation should be added under each of these headings, by watershed, about the status/duration of these projects or, where appropriate, prioritization. Otherwise, it is impossible to tell what actually is to be undertaken or completed in the next reporting period. Highlights in this reporting period included "pilot demonstration projects of new technologies for the improvement of water quality," but there is no further explanation about what these projects or technologies actually were. Another highlight (lines 156-157) was the initiation of data evaluation in the St. Lucie and Caloosahatchee watersheds, but there is no further description of the available data, how long evaluation is anticipated to take, etc. Appendix 7-2 should be restructured, insofar as possible, to convey information more as in Appendix 7-1.

RECOVER – Highlights included the completion of two reports and a guide on adaptive management integration. The first of these was developed as an interactive web page that should be a major help to managers, stakeholders, and scientists in finding information. The second report summarizes system-wide updates of the CERPA modeling conditions. A synopsis of the contents of this important report should be added to the chapter. The Adaptive Management Integration Guide continues the District's emphasis on this important issue. The term, adaptive management, is defined in accompanying Appendix 7-3-1. The excellent explanation in Appendix 7-3-4 (beginning "RECOVER offers two main…) to 7-3-5 should be moved to the main chapter.

In addition to these three major plans/programs, Chapter 7 briefly summarizes two other important watershed programs - the Coastal Watersheds Program and the Lake Okeechobee Watershed Protection Program. Highlights should have been included for both of these, but were only given for the latter. Those highlights indicated an impressive amount of effort, but the descriptions should be improved as follows:

1st highlight - please clarify how much of the 12,000 acres were treated for torpedograss versus water hyacinth.

3rd highlight - The TP load reduced to Lake Okeechobee from the FDACS-sponsored BMP demonstration/ evaluation projects was ~19 tonnes (mt); what percent reduction of the total does this represent?

4th highlight - The TP load reduction from District-sponsored monitoring and evaluation projects through WY2010 was ~27 tonnes (mt); what percent reduction of the total does this represent? It should be clarified - was this is the total reduction over the entire project durations?

5th highlight - Simply lists research/assessment activities conducted in WY2010. Brief additional description of progress in each should be added.

Additional comments about Appendix 7-1:

Understandably, Appendix 7-1 (Part A, Funds) does not yet have complete FY2010 / FY2011 information, so as a "holder" until that information becomes available, the contents of this appendix refer to FY2009.

Table 2 – This interesting table presents what evidently is a complete list of projects/ activities, of which ~39 were funded to some degree in FY2009. The table legend needs to contain more explanation about the table contents (e.g. projects that received major emphasis such as the *River*

of Grass project), and whether the N/A lines (e.g. contributed funding by other local sponsors) will be added to the final 2011 SFER. Information should also be added to the table indicating the status of the many $0-funded projects/ activities.

Figures (maps) – are nicely done and very helpful.
Figure 2 – brief descriptions should be added about each of these five feasibility and reconnaissance studies (main objective, status, projected completion).
Figure 3 – brief descriptions should be added about each of these seven Critical Restoration projects (as above).

Integrative Review

Are large programs presented so that the overall goals are clear and linked systematically to descriptions across the report?
1. The large programs are presented with clear overall goals, and the programs are linked fairly well to descriptions across the chapter. There is frequent cross-referencing with other chapters throughout Chapter 7, beginning with the Summary which mentions Chapters 8, 10, 11, and 12 as containing supplemental information about other restoration initiatives and programs. Brief description of the Coastal Watersheds Program (p.7-7) refers readers to Chapter 12 for further details. However, some opportunities for integration are missed: for example, on pp. 7-7 to 7-8, a description of the Lake Okeechobee Watershed Protection Program (addressing the lake and downstream waters, especially the Caloosahatchee and St. Lucie River estuaries) fails to direct readers to Chapters 10 or 12.

2. Integration is also strengthened through the District's efforts in formatting the *2009 System Status Report* as an interactive web page for managers, scientists, and other end users. This helpful web page contains detailed information about each geographic Monitoring and Assessment Plan (MAP - of CERP) module, including Lake Okeechobee, the Northern Estuaries, the Greater Everglades, and the Southern Coastal Systems. Importantly from an integrative standpoint, the information is organized thematically as well as geographically.

3. With the new means of conveying data and findings (e.g. the *2009 System Status Report*), there is a need, in the introduction to Chapter 7, to better explain the mechanisms by which programs and projects are being summarized and presented in the SFER. The three levels of detail appear to be falling out in a program-project-benefit structure. To further illustrate, explain how text in the main report is a brief programmatic overview; with additional program/project detail in the Appendices, followed by an explanation of the websites where specific project and environmental detail can be found. As it currently stands, the websites are introduced throughout the report and it takes the reader time to connect them together and appreciate the reporting structure. If the panel understands the websites correctly, it is now (or soon will be) possible through the *SFER Consolidated Project Database* and the *System Status Report* to combine individual project status with associated environmental benefits – thus directly connecting program/ project actions/expenditures with environmental results. Of course there is the qualifier expressed on page 8-8 regarding the need for a 'sufficient period of time' for completed projects to operate before expected benefits will materialize. This appears to be a powerful accountability development that needs to be carefully explained and highlighted at the beginning of Chapter 7.

4. Also, with respect to terminology, Chapter 7 could benefit from clarification between program/project accounting and environmental accounting, as stated above. For example, the terms *Monitoring and Assessment Plan (MAP)* and *System Status Report* appear to be missing critical adjectives, *Environmental* and *Ecosystem*, respectively. The *Consolidated Project Report Database* contains the key work *Project*.

5. Page App. 7-3-3 describes restoration performance results that are derived from a model (is the model the *Master Implementation Sequencing Plan*?). the first bullet listed at the bottom of the page states that "Regional groupings of projects provide measurable predicted restoration benefits using RECOVER system-wide performance measures." Are these project administration benefits or environmental benefits due to better project management? If they are environmental benefits, are they being measured in the field and compared to model results? Clarification is needed.

6. Appendix 7-3-2's section, "Adaptive Management Integration Guide and Guidance Memorandum," nicely describes the District's overall efforts to use adaptive management to move through the many uncertainties along the way in resolving and refining how to best implement and integrate various projects to achieve Everglades restoration goals and objectives.

7. Appendix 7-3-3 lists 10 CERP projects as being implemented by 2010 and refers readers to a website for information on the Master Implementation Sequencing Plan and the Integrated Delivery Schedule. Evaluation of the CERP 2015 Band 1 projects listed a number of "important performance results" which need to be better described:

1st bullet - states that regional groupings of projects provide measurable predicted restoration benefits using RECOVER system-wide performance measures, but includes no further information. Additional description is needed.

2nd bullet - does not seem to qualify as an "important performance result" and should be combined with the first bullet.

3rd bullet - states that several opportunities exist for adaptive management, but then simply restates why adaptive management is a valuable approach. More explanation is needed.

9th bullet - requires clarification about the basis/validity of this assumption.

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

Chapter 7 would benefit from more clarification of how its project management accountability focus is related to other SFER chapters' scientific environmental measures and evaluations. Page 7-1 notes that supplemental information regarding other restoration initiatives and programs is contained in other chapters of SFER Volume I, but the list does not mention Chapters 2-6 where environmental measures, such as flows and water quality conditions, are discussed. Given the ecosystem health purposes of CERP, NEEPP, and RECOVER (and the other programs summarized in Chapter 7) reference to environmental outcomes discussed in these earlier chapters is needed. This may involve simply adding these chapters to the list on page 7-1 with a sentence of explanation of how these Chapters relate (e.g. environmental measures being

developed to track program effectiveness via the *System Status Report*) to the projects described in Chapter 7.

The panel may also provide constructive guidance for the District's large-scale programs, particularly as related to water quality assessment and control across the agency.

As an observation, Appendix 7-3 describes an adaptive management approach employed within CERP to address the uncertainties associated with the ability to predict ecological restoration responses (page App. 7-3-2). The panel also notes the need for adaptive management to address the uncertainties associated with the ability to predict human actions that greatly impact the future restoration in the Greater Everglades ecosystem (e.g. development of the *River of Grass* land acquisition that has the potential to greatly enhance restoration).

Questions:

1. Is there a scientific basis (e.g. model results via MISP) that can be referenced to support the hypothesis stated in lines 67-68?
2. Line 58 notes that the purpose of Chapter 7 is to describe 'progress' in environmental restoration projects and initiatives, not environmental results or improvement. Given the overall goal of improving the cumulative regional environmental benefits, this limitation requires further elaboration in the *Introduction*. Many of the points above relate to this limitation.
3. Appendix 7-1 should be reference in line 99 – it is the CERP Annual Report. Appendix 7-3 is RECOVER activities update.
4. The Volume I Table of Contents lists the title of Chapter 7 as 'Everglades Restoration Update' but the title used at the beginning of Chapter 7 is simply 'Everglades Restoration'. This discrepancy needs to be resolved.

Editorial Suggestions:

1. Line 55 – statement that during dry periods, "sufficient water of the right quality is not always available" for the environment and the human population does not accurately describe the serious impacts that are chronically sustained by many of the Southern Estuaries because of altered water supply, timing of delivery, and degraded water quality. Please revise.
2. Line 61 – …7-2 shows the locations of the…
3. Line 114 – add the month to be consistent with the format used for the other bullets
4. Appendix 7-1, p.2, 3rd line from bottom – …to ensure that resources...

PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2011 SFER – VOLUME I, CHAPTER 8

Level of Panel Review: Accountability (primary); Integrative (secondary)
Reviewers: R. Ward (AA), O. Stein (A)

Posted: 09/15/10 at 11:20 AM by R. Ward

Accountability Review

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

Chapter 8 is difficult to review as it is more a listing of projects than a program description followed by a collective assessment of program implementation progress. Much of this difficulty is due to the Chapter being extremely brief - the beginning 'Summary' section is six pages long and the main body of the chapter is four pages. There are no appendices. The purpose of the Chapter is stated on lines 8-9 as follows: "…this chapter presents an update on the progress of the implementation of the Long-Term Plan…". Yet, lines 15-16 state "…updates for many of the Long-Term Plan projects appear in other chapters of this volume." Thus, the project updates, the purpose of the chapter, for the most part, are elsewhere in the SFER. The four pages in the main body of the chapter provide extremely brief updates on 'project-level activities for FY 2010' (one project being updated was completed in FY 2005 and another in FY 2007).

By its title, this very brief chapter would seem to describe how the long-term plan is to be implemented. Understandably the implementation of this plan with 48 individual projects (line 98) is done incrementally and progress on many of the specific projects is described in other chapters such and 4, 5 and 7. That said, it is hard to understand what the long term plan is when reading this chapter. There is no succinct statement such as "The long term plan is to ….." The description of the evolution of the plan is equally vague. For example, a chronological description of how the plan was developed is not used in lines 82-97. Better to start in 2003 and work forward in time. The significance of the phosphorous rule and the district judge's ruling on the CWA are not clear from these paragraphs.

An assessment of how the Adaptive Implementation has been working is warranted. If no modifications have been made in the past two years, it would seem that either the plan is working perfectly or an adaptation component is missing.

Based on the above observations, the Panel questions whether Chapter 8 satisfies its purpose of completeness and thoroughness regarding accountability for the Long-Term Plan.

Is the synthesis of this information presented in a logical manner, consistent with earlier versions of the Report?
There is very little synthesis in Chapter 8. There are no data and findings presented regarding the collective implementation of Long-Term Plan projects, other than lines 28-31, at the beginning of the 'Summary' section noting reductions in TP load. Chapter 8 would benefit greatly from a section summarizing data and findings regarding water quality improvements related to Long-Term Plan project implementation.

Given the briefness of Chapter 8, the Panel sought additional information regarding the implementation of the Long-Term Plan. The only readily available additional sources of

information cited in the text are four live links. In the 2010 SFER there were links in several of the project-level activity descriptions to provide additional detail, but it was not clear how to click to the relevant information. Rather than add information about the clicks required, the 2011 SFER removes the links and notes that relevant documents can be obtained by contacting the District/modeler. Removing ready access to additional information is counter to other SFER Chapters that are adding additional links to more information (e.g. Chapter 7).

The four links provided in the 2011 SFER Chapter 8 include a link to the District's Strategic Plan which confirms that the Long-Term Plan is a 'Strategic Priority'. The *River of Grass* land acquisition opportunity is mentioned on line 167 and in the District's Strategic Plan, but the implications of this opportunity on the Long-Term Plan are not discussed other than to note delay in the Inflow Volumes and Loads Project.

The link to the Long-Term Plan provides a more complete introduction to the Long-Term Plan and the Panel suggests this type of information would be useful at the beginning of Chapter 8. For example, the Plan could be introduced in a more comprehensive manner with such wording as:

> **Long-Term Plan for Achieving Water Quality Goals**
> The Long-Term Plan is a comprehensive set of water quality improvement measures designed to ensure that all waters entering the Everglades Protection Area (EPA) achieve compliance with water quality standards. These measures include enhancements to the existing Stormwater Treatment Areas (STAs), expanded best management practices, and integration with the Comprehensive Everglades Restoration Plan (CERP) projects. In addition the Plan continues the strong science-based and adaptive implementation philosophy to allow continuous improvement until the long term water quality goal is achieved.
>
> The Long-Term Plan was developed in response to the 1994 Everglades Forever Act (F.S.373.4592) requirement that the District submit to the Florida Department of Environmental Protection (FDEP) a plan by December 31, 2003, for achieving compliance with the phosphorus, and other state water quality standards in the EPA, and to include the estimated costs, funding mechanisms and implementation schedules associated with the plan. In response to this requirement, the Long-Term Plan for Achieving Water Quality Goals (The Long-Term Plan) was developed.

The link to DMSTA gets into operational details of the model without describing how it is actually used in implementing the Long-Term Plan. There was a paragraph describing how DMSTA is used in implementing the Long-Term Plan in the 2010 SFER but it has been removed in the 2011 SFER.

The last link, in the Revisions section of the Chapter, led to a webpage where the additional clicks needed to acquire the referenced information were not clear.

Thus, for reasons noted above, the Panel questions whether the synthesis of information presented in Chapter 8 is complete and improving from year-to-year.

Are findings linked to management goals and objectives?
Management's goals for the Long-Term Plan are to ensure that all waters entering the Everglades Protection Area (EPA) achieve compliance with water quality standards. There is no attempt in Chapter 8 to develop findings or insight regarding progress in achieving compliance with water quality standards. Instead, it is noted that "…until the Long-Term Plan projects have been implemented for a sufficient period of time, it is not possible to measure certain responses of the EPA to the Long-Term Plan projects." No discussion is provided regarding when the measurement of water quality improvements related to the Long-Term Plan will begin. What is the definition of 'a sufficient period of time'? What are does the term 'certain responses' mean?

It is noted on page 8-8 that Chapter 3A provides information on the status of water quality conditions within the EPA and that there is a measurable reduction in the TP levels in discharges from the Everglades Construction Project basins (no Chapter number is cited). After seven years of formal implementation of the Long-Term Plan, there needs to be more synthesis on its collective implementation status and of its impact on water quality conditions related to management goals and objectives. For example, is the Long-Term Plan 50% implemented; 70%; 90%? Chapter 3A, alone, provides considerable data and findings that can be synthesized regarding progress of the Long-Term Plan in meeting management's water quality standard compliance goals and objectives.

Integrative Review

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

Project names and SFER Chapter references of individual Long-Term Plan projects are noted in Table 8-1. Without more collective synthesis of Long-Term Plan projects, it is difficult to conclude that the Long-Term Plan is presented with overall goals that are clear and linked systematically to other descriptions across the SFER. A simple table listing Chapter numbers with individual projects is not sufficient to answer the above question in the affirmative.

Is the chapter cross-referenced in a thorough and consistent manner?
Beyond Tables 8-1 and 8-2, there is very little mention of Chapter cross-referencing. Again, without more synthesis of collective program goals in Chapter 8, there is little basis for chapter cross-referencing.

The panel may also provide constructive criticism and guidance for the District's large-scale programs, as appropriate.
It would seem that this chapter is the one place in the document that should attempt to integrate all of the various Long-Term Projects the district is undertaking and demonstrate how they relate to the Long-Term Plan's goals and objectives. Thus a golden opportunity to present a succinct overview of the district's goals and how projects relate to the Plan has been missed.

It should be possible to identify a set of monitoring sites from those assessed in Chapter 3A to create an *indication* of progress of the Long-Term Plan in meeting its management goals and objectives. Such an assessment could be an sub-activity extension of the Chapter 3A assessment each year, using the previous year's Chapter 3A's data and findings (to give time to prepare an assessment).

From an integrative perspective, the briefness of Chapter 8 makes it difficult for the Panel to fully understand connections of the Long-Term Plan to the Comprehensive Everglades Restoration Plan and RECOVER program (Chapter 7). Given the common large program update objectives of

Chapters 7 and 8 and the need to understand the relationships between the three major initiatives being discussed, would it be possible to combine the three large program implementation updates into one Chapter with one over-arching introduction to the relationships involved?

On the more technical side:
The chapter claims (lines 28-31) that 3500 metric tons of P that would otherwise have gone into the Everglades has been prevented from entering. Presumably a mass balance of P in the STAs could back up part of that claim, but how has the effect of BMPs source reduction been quantified? Is there a reference or SFER Chapter that can be cited?

What is the four-part P test and how does that relate to the plan and modifications to the plan? (Lines 90-91).

Is four percent of the STA inflow to the STAs considered "significant" or "insignificant"? (lines 174-175) How do the lake inflows to STA affect the plan?

PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2011 SFER – VOLUME I, CHAPTER 9

Level of Panel Review: Integrative (primary); Technical (secondary)
Reviewers: J. Burger (AA) and J. Burkholder (A)

Posted: 09/16/10 at 10:00 AM by J. Burger

INTEGRATIVE REVIEW

This level of review should evaluate how well the chapter provides integrated summaries of information, and it can also evaluate cross-cutting themes and the connections between research and water projects. Questions that have been recommended by the District for consideration in integrative review are:

- Are large programs presented so that the overall goals are clear and linked systematically to descriptions across the Report?
- Is the chapter cross-referenced in a thorough and consistent manner? and,
- Can constructive criticism and guidance be contributed for the District's large-scale programs?

Overall, the large programs described in Chapter 9 have clearly presented goals and they are generally linked to descriptions across the chapter. The chapter is cross-referenced fairly well, nicely assisted by Table 9-1 which references coverage of invasive species issues in other chapters and volumes of the 2011 SFER. In the writing, some opportunities for integration still are missed. For example, the discussion of hydrilla in the Kissimmee Chain of Lakes (p.9-28) does not mention Chapter 11 (Kissimmee Basin), and the information presented about torpedograss in marshes surrounding Lake Okeechobee (p.9-29) does not mention Chapter 10 (Lake Okeechobee).

Recognition of the severity and impacts on ecosystems of nonindigenous species is relatively new, especially for animals in the Everglades. CERP, the RECOVER programs, and other governmental and non-governmental agencies have the potential to respond to these new and emerging problems that affect the overall health of the Everglades. The Everglades group and its partners are well ahead of other groups nationally in trying to understand, catalogue, and evaluate the effect of nonindigenous plants, with an eye toward both severity and management. An overall approach of examining all nonindigenous plants and animals that seem to pose a threat to the Everglades ecosystem is a daunting task, but an essential one.

In its integrated efforts with various other agencies, the District's ongoing work and accomplishments in addressing the critically important issue of nonindigenous species in South Florida are impressive and expanding, including its aquatic plant management program which is the largest such program in the nation. It is not surprising, therefore, that some of its successes, such as its Melaleuca program, are respected models for regional, interagency programs to combat nonindigenous species. Some other major success stories are also exciting, and certain new biocontrol agents are showing great promise. A key feature of the District's approach lies in its prioritization of the plants and, in more recent efforts, the animals that present the greatest threat to restoration efforts. As the chapter authors note (lines 56-60), this is no small task, and the panel strongly supports the authors' recommendation to prioritize animal-related threats across regulatory agencies, as has been done for nonindigenous plants. More broadly, the

excellent recommendations made throughout this chapter, if followed, would make major advances in controlling nonindigenous plants and animals across South Florida.

Past chapters have been more inclusive of all invasive plants, with much less coverage of invasive animals. This chapter does not include all nonindigenous species for which there is information (the reader is referred back to the 2008-2010 reports). Rather, its focus is on priority species, those considered to pose the greatest threat, and it focuses fairly equally on both plants and animals of concern. The chapter provides an excellent overview of the biology of 24 nonindigenous invasive species that have been evaluated as posing the greatest threat to ecosystem structure and function within the Everglades. The approach is to provide an overview of each of these species, including the key issues, including excellent "stoplight" information. This approach is very useful for managers, public policy makers and the public to obtain a clear, readable account of the priority species of concern, management issues, and the status of present severity of the problem.

Appendix 9-1 merits additional comment, as it is the one place where a broader approach to nonindigenous species is discussed. It provides information on the modules where these species are of special concern. This could be more useful if there was some overall indication of the severity generally for the Everglades, and perhaps which module they present the greatest threat. Moreover, the Table summary is useful, but it would be helpful to identify in one place the species found in all modules since this indicates a greater threat (this information is in the table, but it would be helpful to have it in one place).

The biggest integrative task for this chapter (as for other chapters) remains the integration of efforts by different agencies that monitor, manage, and provide expertise on non-indigenous species. Toward that goal, this year's SFWMD report is excellent in its integration of nonindigenous invasive species with Chapters 5,6,10, 11 and 12 – a vast improvement over previous years. For the first time this year, other chapters have integrated some of the major invasive species problems. For example, Chapter 6 has a full section on invasive nonindigenous species, with information on prognosis for restoration impacts, and recommendations for each of 12 priority invasive species affecting the Everglades. The recommendations in Chapters 6 and 9 provide different perspectives on these species that will be especially useful to managers and the public. Such integration is essential for the ultimate recovery of the Everglades, since invasive species have the greatest potential (with hydrology and hurricanes) to alter the structure and function of the Everglades.

TECHNICAL REVIEW

As this chapter states (lines 167-168), "Without successful control of invasive, nonindigenous plant and animal species, the benefits of restoration efforts will be reduced." The authors take this sobering assessment a step further (lines 200-201) and frankly acknowledge that "without a long-term commitment to invasive species management, the goals of Everglades restoration are unlikely to be achieved." They also realistically define successful control (lines 187-188) as minimizing the impacts of most of these species rather than complete eradication, and estimate (lines 511-515) that even that goal likely will require decades to accomplish.

The technical aspects of Chapter 9 are improved over last year's report in that the summary table (9-1) is more inclusive of management options and effects, and the stop-light status of the key species is given by RECOVER module. The latter provides an immediate, clear graphic representation of the invasive species problem across the Everglades.

The introduction provides an excellent statement of the problem of invasive species, the problem in the Everglades, the SFWMD role, and the agencies involved. The inclusion of the species that require the highest level of control or are research priorities is an excellent focus. It provides the public and public policy managers with the needed information to mobilize interactions and coordination among and between agencies and organizations to deal with these species. In the helpful and interesting section on legislative and policy initiatives, it was frustrating to learn of the painfully slow process involved in the petitioning process to list the Burmese python as an injurious species, but encouraging to learn of the State of Florida's progress during 2010 toward more proactive, preventative regulation of nonindigenous animals. The Early Detection/ Rapid Response Plan is an important step forward (as demonstrated on p.9-29), as is the creation of a mass rearing annex for organisms of use in biological control.

The key issues section rightly identifies most of the key issues, and the inclusion of the tools for control of both plants and animals is both necessary and informative. Some additional mention should be made of the commercial aspects of the nonindigenous species problem (garden shops, landscapers, pet stores). That is, sometimes nurseries are selling plants that are (or will become) invasive species problems. While this generally does not affect the priority species, it could affect the species that could become major problems in the future.

The section on nonindigenous species in the restoration context is important, and acknowledges the key importance of these species to RECOVER efforts. It would be helpful to provide additional information on how failure to respond (mainly because of funding constraints) is projected to impact South Florida ecosystems. Further, the new section on control tools places a context on the individual descriptions that follow. This section should be enlarged in further documents to provide specific examples.

The section on ongoing regulatory efforts to control exotic, injurious species, especially constrictor snakes, is an excellent addition, and it provides a framework for managers and the public alike. Presumably, these sections will be updated before the final report is completed, as will Table 9-2 which is going to show expenditures to address 11 priority species in each module. The District and associated partners may need to convene a workshop specifically to consider how to identify emerging invasive species before they present any problem. While this is a daunting task, it is essential, especially for the Everglades with their unique environment.

Overall, the descriptions of priority nonindigenous species are excellent, and include a short history, effects, and where it occurs, the control measures. Where possible, some quantification of both the problem and its solution would be useful. While some of this information (e.g. extent of occurrence of an invasive species in the Everglades overall) is presented in other chapters (e.g. 6), it bears repeating in this chapter. Thus, quantitative indications of severity and management success would be useful.

The establishment of a tracking system for the large constrictor snakes and other exotic reptiles is an excellent step forward in understanding the problem for these species that are increasing rapidly and have the potential to drastically affect the Everglades ecosystem. The District is making strides in tracking invasive species and is to be commended, given the enormity of the situation, the agencies involved, and the rapidly changing landscape of invasive species.

Appendix 9-1 is a wonderful addition to the overall SFWMD reports, and will be extremely useful for managers, the public, and public policy managers. It provides a general overview for not only the general reader, but for agencies and personnel working with these species. Further, it integrates among the different regions within the Everglades, providing a quick reference to the extent of the problem.

It might be useful to develop of table that lists the key invasive species for each RECOVER module, which might suggest and illustrate whether groups of species are particular problems in each module, and require a coordinated effort for species groups. Such a table might indicate where the greatest invasive species problems occur.

The Conclusions section summarizes the main findings in terms of issues, documented impacts, and needs for future control and management. The use of the early detection and rapid response system is excellent, and has the potential to prevent future problems, but this will only work if the gardening, landscaping, and pet trades are onboard and cooperate with agencies. Information on the Interagency Team to discuss next steps for control of invasive species was very useful, and the conclusions important to this chapter. The emphasis on risk assessment is interesting, but requires a few more details, since a strict risk assessment paradigm may not be possible given the limited information on both. Therefore they must be using a slightly different assessment strategy, which would be informative to present.

Providing information on successes (e.g. Melaleuca) is an excellent tool for engaging both the public and managers. It is a model of success, and the lessons learned from this program could be described in a little more detail in the body of the chapter.

Since the issue of non-indigenous snakes has been so prominent in the news, some indication of success (not just how many have been removed) would be useful. The potential for other constrictors (and lizards) to become a problem suggests the need for more aggressive control and higher funding levels. The introduction of such top-level predators has the potential to drastically change the structure and function of Everglades ecosystems.

TECHNICAL COMMENTS FOR THE AUTHORS

Summary

This section is excellent, and provides a good overview of the report. The inclusion of both threats and control measures is a nice feature.

Introduction

The introduction provides an excellent overview of the problem internationally and nationally, as well as a focus on South Florida. The presentation of historical information (i.e. when climbing fern was first collected as a naturalized plant) is extremely useful in providing a context for the extent of the problem.

Line 168: It would be helpful to add some information about what the major effects might be (while examples are given later, a summary of the types of effects here would help).

Line 189: Please add a supporting reference(s) for this statement.

Summary of Invasive Species Control Tools

This is another excellent section.

Line 218 and following: For each of the major methods, it might be useful to provide an example for each.

Line 243: again, provide an example of each.

District's Invasive Species Program

Line 285: Who decides what species are monitored, and how are new "emerging" species identified before they become a problem.

Table 9-1: This is an excellent table. It would be helpful to cite at the end of each Outcomes/ Findings section any chapters that specifically discuss each one (for example, Chapter 6 discusses many of these species in terms of control).

Updates

Line 343: This section is an excellent update of regulations

Line 326: Presumably the fate of this bill will be update before the final report.

Line 378: This update is excellent, and should be repeated in future reports.

Line 388: Are there any other working groups for other species. This seems to be an excellent mechanism.

Table 9-2: Should be provided as soon as possible

Line 515: As in various other locations throughout the chapter, progress in controlling non-indigenous species is being severely impeded by funding constraints. It would be helpful to add a short section on efforts and plans being undertaken to address the serious funding issues.

Line 579: Please clarify whether these "dog" methods have been successful elsewhere, or with other snakes (include supporting reference).

Lines 584-585: Add brief explanation of why trapping techniques for the Nile monitor are working in Southwest Florida, but not in Southeast Florida.

Line 697: Explain efforts that are being undertaken to make sure there are high enough populations of the moth.

Lines 709-716: Briefly explain why another attempt is planned to use white lygodium months against lygodium, despite the fact that it appears that this potential biocontrol agent is neutralized by predatory ants.

Line 729: Explain the effect on SAV in these waters.

Lines 744-753: It would be helpful to briefly explain the process involved in developing biocontrol agents.

Line 754-772: This is an excellent source for interested scientists and the public. Explanation should be added about how very new "emerging" species are identified (including the agency or agencies involved).

Line 788: It seems that the aerial monitoring is also not good for animal invasive species; discussion of this point should be added.

Line 820: While rating scales are important, absolute numbers should also be provided to evaluate the extent of the problem (where possible).

Line 826: Common protocols are a necessary and laudable first step.

Line 865: The authors should explain whether there are ways to control this species on private lands, and whether there is an education outreach effort to help in this issue.

Line 891: Positive information is also useful.

Lines 894-896: Add explanation as to where the sacred ibis was eradicated.

Line 909: This is extremely useful information.

Priority Nonindigenous Species

Overall, this is an excellent section, and the authors are to be commended. It is clear, concise, and provides useful information to a wide range of stakeholders. It is compelling and fascinating to read, with nicely summarized information on the species biology, distribution, control tools, monitoring efforts, interagency coordination, regulatory tools, and identified critical needs. The panel also appreciates the authors' careful writing that acknowledges potential shortcomings in the analysis (Appendix 9-1) because of the limited availability of distribution data.

Lines 919-949: Should mention the number of plants and animals covered in this section as priority species.

Line 934+ : This is an excellent statement of process.

Line 950: The use of black and white symbols, in addition to color, is extremely useful.

Line 966: Appendix 9-1 is extremely valuable, and a wonderful addition to the chapter. It might help to add some indication of severity to this table.

*The overall information provided on the individual species is excellent, as are the stoplight codes – a consistently great feature of this chapter.

Line 1018 (as for line 865): The authors should explain the educational programs that exist for the public and private lands. This might be a useful tool for this species.

Line 1050: It seems that there is a need to develop educational plans and outreach to condominium and senior citizen housing complexes – this might eliminate a lot of the problem.

Line 1089: What efforts are made to reach the corridors, for this and other species? This may be a problem for other species.

Line 1123: Is it is so designated, can it be sold in nurseries? Is there a possibility of producing information brochures on the invasive plants to have available at nurseries?

Line 1162: The panel agrees that a biological control is necessary.

Line 1183: Clarify whether an extensive educational program and stakeholder group program been initiated with all of the invasive plants. More generally (e.g. lines 865, 1018, 1050, 1183, 1474, etc.), it would be very helpful to add an education outreach update to this chapter.

Line 1205: Add information about how far north in Florida this species can survive.

Line 1232: For almost all of the invasive plants, a major part of the problem is private lands. The authors should add information about whether a group (task force etc.) is in place or planned to address the problem of invasive species with private land owners.

Line 1268: Comment on whether experiments are planned to find another herbicide mixture for this species.

Line 1366: Clarify which agency coordinates development of biological control (for this and other plant species).

Line 1474: Additional educational campaigns in the pet trade may be essential to help curb the sale of these. The authors should add information about public education efforts in this regard.

Lines 1586+: Developing regulations for this and other species is extremely important, as eels can become an important, underground fishery, both for local and international consumption. For example, eels have become a lucrative, illegal trade for sale in Japan.

Lines 1625: The fisheries and pet trade implications should be carefully explored; otherwise, control will be difficult. The authors should explain whether this being done.

Line 1658: Please explain why the Cuban treefrog is a problem only in Big Cypress - this seems to suggest that it may become more critical elsewhere.

Line 1709+: Brief explanation should be added about what happened to the trapped Sacred Ibises.

Line 1728: Add information about whether the state has protection of native species, and allowing free control of non-native species. Also add information on the estimated number of ibises, if available, the origin of their introduction (releases, pet trade, zoos?), and whether there are problems with this species in other southern states.

Line 1734: Please add the maximum size.

Line 1754: Briefly address whether there are state regulations against having them as pets.

Line 1801: The authors recommend that a research advisory panel should be formally established to facilitate prioritization and coordination of efforts to control the Burmese python, considering the present/chronic constraints of limited resources and tools. It may be that there should be an advisory group for each of the major reptile pests; such a group could consist of academics, conservationists, pet trade people, and agency scientists to specifically deal with each species.

Emerging Threats

Line 1878: This is a very important section, and will provide useful information to NGOs and other organizations wishing to get a head start on control of potential problems.

Line 1884: Clarify whether there an established working group to consider new emerging threats, and the possibilities before they become real problems?

Line 1938: The numbers (=19) is very useful, because it describes the extent of the current problem. Please add information, as well, to address the following questions: What other species use the melaleuca slash piles, and will their removal be hurting some native species? What happens to the removed snakes? (is there a possibility they will end up being released at some future time?).

Conclusions

Line 1970: While it is true that the number of invasive animal species is very large, the approach of prioritizing – that is, of targeting the primary or most important ones by the SFWMD – is an excellent one.

Line 1977-79: This sentence is confusing, and its meaning is unclear. Please restructure.

Line 1996: The earlier section on tools available is very important; perhaps a special workshop should address other tools and innovative approaches.

Lines 2013-2025: The interagency team's efforts represent a very important process that should continue periodically. Among the team's key recommendations was increased research focus on risk assessment models to support prevention initiatives, and more details on the risk assessment paradigm for invasive species would be helpful in future reports. The panel also hopes to see major progress described on the other four key recommendations in future SFERs.

Editorial Corrections / Suggestions

Entire chapter: Has a problem with skipping spaces within words, which makes it difficult to read. Please correct.

Line 34: …aquatic plants such as hydrilla

Line 676: Clarify "flies"

Line 759: Should define FNAI (it is defined instead on the next page)

PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2011 SFER – VOLUME I, CHAPTER 10

Level of Panel Review: Technical (primary); Accountability (secondary)
Reviewers: P. Dillon (AA), V. Novotny (A)

Posted: 09/19/10 at 03:02 PM by P. Dillon

TECHNICAL REVIEW

Are the findings and conclusions supported by "best available information," or are there gaps or flaws in the information presented in the document? Are there other interpretations of the data and other available information that should be considered by the authors and presented to decision makers?

Each of the major sections of the chapter is reviewed below in response to the above questions. Following comments and questions for the author, any comment on technical detail is identified by page number.

General comments

This chapter provides an extensive amount of information on the current status of Lake Okeechobee and on measures that have been introduced to control its nutrient, particularly phosphorus, input. The extent of the work is impressive and, while all technologies haven't been successful, the work and the interpretation of the results appears to be technically sound.

Nevertheless, progress has not been rapid and the challenges appear to be almost insurmountable. This lake was on the 303 d list of impaired water bodies. The current (2010) phosphorus load from the watershed and the atmosphere was 478 metric tons and the 5-year average was 496 metric tons. The TMDL is 140 tons. This means at least 65% of the current TP input must be removed. The report recognizes that it will require decades to reach the goal.

A. SUMMARY

The summary provides a clear and reasonably concise overview of the work that follows. Rather than repeat questions about specific issues, they are provided in the following sections.

For the new reader, a table of acronyms would be very helpful immediately before or after the summary.

p. 3 - The report uses "mt" for metric tons. In the metric system mt would mean "milliton" which is a kilogram. Also the hectare-meter (10,000 m^3) unit does not exist. One hectare is 10,000 m^2 which is a legitimate unit of area.

B. INTRODUCTION

The introduction is short but covers the 2 most important subjects – what are the key stressors, and how is the lake used.

p. 6 – Fig. 10-1 would be more useful if it showed the sub-watersheds' boundaries

p. 6 – a fundamental parameter useful in understanding lakes is the lake's water replenishment time, i.e. how long it takes for the volume of water in the lake to be replaced by it total inflows (assuming complete mixing). This can be calculated from the lake volume and the total inflow (or outflow), and should be reported here along with the basic morphometry.

C. OVERVIEW OF THE LAKE OKEECHOBEE WATERSHED PROTECTION PROGRAM

The administrative structure of the watershed protection program and its linkages with various statutes, etc. sounds complicated but Fig. 10-2 clarifies much of the structure clearly.

Watershed construction projects Phase I – Three projects undertaken in Phase I have had very mixed success. The sediment removal pilot project failed to remove phosphorus. One of the two constructed stormwater treatment areas, Nubbin Slough, was completed in 2006 but is still not working. Furthermore, there is apparently concern that an average rainfall year will not provide enough water to operate this STA on a full-time basis. This sounds like a design flaw, but the details about the design and rationale for this project are undoubtedly in other earlier reports. The second STA, Taylor Creek, has been more successful, but it too has had problems. The removal efficiency for TP of the Taylor Creek STA is disappointing and not in agreement with the literature. There is not enough information in this section to understand what the expectations for these STAs are, e.g. whether the P removal should occur via plant growth or via sediment accumulation. Again, these details have almost certainly been discussed in earlier report. In the north, in areas that I am much more familiar with, stormwater treatment ponds are not very effective in removing nutrients, largely because the cold winters result in plant mortality, decomposition, and subsequent re-release of nutrients in winter and spring. If plant growth is seen as a means of trapping nutrients in these systems, are there plans to continually harvest the plants to optimize nutrient removal? Or is sediment accumulation the rationale?

Watershed construction projects Phase II – Three additional construction-related projects are identified here, all with the objective of reducing P inputs, and one with the additional objective of creating additional water storage.

Watershed phosphorus control program – discussed later

Exotic vegetation control – The need for control of exotics, both plants and animals, is clear. If control of aquatic plants is carried out by chemical means, two adverse effects can occur. Significant amounts of toxic chemicals are introduced into the system; these may affect non-target species and may also persist and bio-accumulate. What pesticides have been used and at what rates have they been applied? In the past, in some lakes, algicides included arsenic or copper that now represent legacy pollution have been used. Secondly, a large quantity of nutrients is re-released into the water. There are no details about this work in this chapter but I would like to see a brief paragraph mentioning the consideration that has been given to these adverse effects. And I would like to see an estimate of the potential for nutrient removal from the system by mechanical harvesting, e.g. what amount of P would be removed by harvesting 20,000 acres of torpedo grass?

Internal phosphorus management program – Sediment release in this shallow lake will almost certainly lead to elevated lake P levels even after reduction of P inputs. Dredging and chemical treatment are cost-ineffective. The statement is made here that previous conclusions about the possible treatment methods will be re-visited and other options considered. This is an almost

intractable problem. The lake is so shallow that aeration of the bottom sediments would probably accomplish little or nothing. The commercial product PhosLock which basically uses bentonite (a clay) to deliver lanthanum to the system might work, but it requires approximately 100 tons of PhosLock per ton of P removed. The lanthanum acts as a chelator, making the inorganic P unavailable to the biota. This is likely prohibitively expensive. My best suggestion is to use an iron compound – commercially available, relatively cheap, and less side effects than alum.

Basically, the report dismisses the feasibility of managing the nutrient content of the sediments too quickly. It is true that these measures would be temporary until the P load to the lake is dramatically (by about 65%) reduced and the water concentrations are reduced to the TMDL level of 40 μg/L (still eutrophic conditions). If the sediment concentration of nutrients is not reduced at the same time as the TMDL measures are being implemented, the impact of nutrient reduction will be minimal. For example, in the Lake Delavan (WI) restoration effort in 1980 the worst algal bloom occurred two years after the major source of phosphorus (a fertilizer plant) was eliminated. It is obvious that the problem of sediment remediation will be much larger than that for the (much) smaller Lake Delavan. More discussion and more data on sediment contamination with nutrients and their accumulation in the sediment are needed.

p. 8 –water quality standards to be achieved by the LOPP plan are mentioned. Florida has narrative nutrient standards. Numeric standards were not specified in the report. Is the TMDL load of 140 metric tons of TP a standard?

p. 15 – where did the numeric goal of 40 ug/L come from and what was the required margin of safety?

p. 27 – there is a statement that effluents from septic systems are the source of TP from urban areas. It is known that excessive nitrate pollution can be attributed to septic tanks but not TP, unless the septic tanks are failing or are in sandy soils. Is there any information on failures of septic tanks in the vicinity of Lake Okeechobee and its tributaries? There are household-size treatment options for septic systems on the market – is there any study of this or consideration of the potential benefits?

D. WATERSHED STATUS AND MANAGEMENT

Watershed status -

The phosphorus and nitrogen inputs are estimated from continuous flow data and chemical measurements made bi-weekly or monthly. The chemical measurements should be made more frequently given the importance of these loading estimates to the overall protection program. Key hydrologic events that may account for a significant part of the annual flux can be missed entirely when sampling with this frequency. Furthermore, the additional costs would be minuscule compared with many of the other costs of this program. I recommend that sampling occur at least weekly, and that event-based sampling be conducted on all major inflows, possibly using auto-sample collectors.

The scale of the problem is made very clear here. Even with extensive and expensive efforts to reduce P loading, the input are still about 3 times the sustainable load. And the internal sources may very well contribute for decades. It is very hard to see how the goal of 140 tons can be met in 4 years.

Where did the number for the contribution of precipitation to the P budget of 35 tons came from? Based on experience in the north, I guessed that the number should be higher. However, the best information I can find in the literature is probably Pollman et al. (2002, Atmos. Environ. 2309-2318). Their figure of 7.5 mg/m2/yr for southern Florida would translate into about 15 tons/yr rather than 35 tons/yr. I presume the relatively low value results because most of the precipitation

is of marine origin. If 15 tons is used instead of 35, the reduction needed is 20 tons less than anticipated.

Lake Okeechobee resembles very closely Lake Taihu in southeast China which is also in a subtropical warm climate, is shallow, has high nutrient loads and has reached hypertrophic conditions evidenced by dense looms of cyanobacteria. Cyanobacteria are also present in Okeechobee, and algal blooms are occurring but the algal population is apparently still dominated by diatoms (2.6/1 ratio) and transparency is still generally good to fair, most likely because the N/P ratio is relatively high. Cyanobacteria blooms are extremely noxious, often leading to high levels of toxins such as microcystins, and the managers and stakeholders should be aware of this and prepare some plans and measures to prevent this.

Watershed management -

It is obvious from the nutrient budget and the reported maximum allowable P load that water treatment methodologies alone will be inadequate and that every possible measure has to be used to reduce the P load. The BMPs on agricultural land will have to play a key role. It is good to see not only such positive steps being taken but that the follow-up work to assess their benefits is routinely done. The 19 ton reduction in P input reported here is significant. It would be very useful to know what the maximum P load reduction that could be anticipated is if BMPs were applied to all of the agricultural land areas in the watershed.

It is not clear what the relationship between the FDACS and the FDEP programs are. Is there a separate estimate of the load reductions that the FDEP programs have resulted in?

The isolated wetland restoration projects have been less successful. The monitoring data, although sparse, indicate that the estimated P load reductions have not occurred; the suggestion that oxidation of organic matter during dry periods and subsequent release of P is the cause is very plausible, in fact, almost predictable. There are considerable data in the literature suggesting that wetlands are not really great P (and N) sinks in the long-term. They accumulate nutrients in the growing season but release most of them during periods where the vegetation decomposes (either from drought or cold). Before additional resources are expended on this control methodology, I recommend that, a) the plan for collection of better data to determine how well the existing project sites are working be initiated on a year-round basis, and b) that a thorough review of similar work done elsewhere be initiated.

Re former dairy remediation, I can't reconcile the data in Table 10-6 with that in Table 10-7. This should be made clearer.

The BAT projects undertaken on the dairy farms seem promising. Again, what is the potential overall P load reduction if these technologies were implemented throughout the entire watershed?

The FRESP program also seems promising but an estimate of the overall potential for P load reductions would be very useful here.

In summary, this section provides a very good update on projects that are directed toward reducing P loading to the lake. What is missing is a discussion of how much of the required load reductions, projects of this nature could accomplish towards the ultimate reduction goal if implemented on a watershed-wide basis. This might make the massive reductions needed seem less daunting.

p. 20 – Far too many significant figures are used in parts of this report, e.g. Table 10-1. The data cannot be accurate to 7 significant figures.

E. WATERSHED RESEARCH ASSESSMENT AND MONITORING

Research and assessment – This section of the report discusses 11 projects that were designed to remove P. Table 10-8 provides a very good summary.

The algal turf scrubber facility has been a failure, apparently because of toxicity of the influent waters to green algae. Surfactants in pesticides/herbicides are sometimes more toxic to biota than the active chemical constituent, e.g. the surfactant nonyl phenol is the most toxic ingredient in several formulations. Could this problem be alleviated using rooted macrophytes rather than algae?

The MIKE SHE/MIKE 11 model appears to work well and should be useful in projecting both future load scenarios for the specific projects that it was calibrated with but also in predicting potential benefits of proposed new projects. Will it be used this way?

The nutrient budget analysis for the watershed as a whole is very useful; these estimates should be done annually to track trends. With respect to fertilizer use on agricultural lands, one option is to regulate its use based on need as determined by soil analysis; where I carry out research, fertilizer is often used needlessly as "insurance" that yields will be high even though analyses show that it is a wasted expense. There are plans under consideration to regulate these applications in a large basin in southern Ontario that has an important lake stressed by high P loads.

Urban land uses represent a disproportionate import of P. In the same location in Ontario, fertilizers containing P are likely to be banned in the urban environment for use on lawns.

The hybrid wetland treatment technology worked very well. Four sites were studied with 3 additional sites started or about to be started. What are the long-term plans with respect to implementing this technology on a watershed-wide basis?

The BMPs related to livestock management show promise. The ditch fencing reduced P loads and is probably one of the least expensive BMPs that can be undertaken. Again, it would be useful to address this in a broader perspective – how many km of waterway could be fenced, and what is the potential benefit? The wetland water retention results are less decisive, because of changing hydrology before and after the treatment. What do P concentrations instead of loads demonstrate?

Water quality monitoring -

The monitoring of nutrient levels seems quite extensive with a large number of sampling stations as part of the routine program. The number of sampling dates, however, is not particularly high, with many sites sampled on average (Table 10-10) only every 2 weeks.

The amount of data collected is adequate for assessing loading trends. At 5 of 8 sites there were no significant trends over the sampling period. However, the trends that were found were in the right direction (decreasing P load and/or concentration), and there were several other near-significant trends of declining P. It is important to look at both load and concentration in these studies because of the important role of hydrology.

The conclusion that more aggressive nutrient control measures are needed to reach the 140 ton limit is the key finding of this report. Furthermore, the 140 tons will reduce the lake P only to 40 ug/L, a level that still represents a eutrophic system.

F. LAKE STATUS

Performance measures – Of 11 performance measures indicative of lake status, only 2 have been met. This is not surprising given that the P load is much greater than the required or sustainable level of 140 tons. Nevertheless, most signs are positive. The nutrient concentrations

declined in both the open water and the nearshore water. Clarity increased and submerged aquatic vegetation increased.

The statements about the changes in TN, TP and the TN/TP ratio are not consistent. If TP drops proportionately more than TN, then the ratio must go up, not down as the report states.

p. 53 – "…the current 5-year average is more than two times…". It is actually three and a half times higher.

p. 53 – when discussing TN/TP ratios it is necessary to clarify whether the reported ratios are by weight or by mole. Weights are used throughout this report when concentrations are reported, but when considering N/P ratios, Redfield ratios are always in the back of the mind of the reader and these are molar, not weight, ratios.

Hydrology – Water level management goals for the most part were met. In the case of future droughts and high rainfall years, is a plan in place to deal with these situations?

It should probably be mentioned that the definition of water year used throughout the report (May to April) is not the standard, which is usually October to September.

Nutrient budgets – As mentioned earlier, the source of information on the input of P via precipitation is unclear; the number may be too high. A lot of detail is given here about the sedimentation coefficient σ; although the presentation is accurate, the simpler term, retention (R_p), gets the same information across, is easier to grasp and is more appropriate to a report not intended for the scientific literature. I suggest reporting the P (and N) retention coefficients (the fraction of the input that is not lost via outflow or increase in water column concentrations).

Fig. 10-21 is important because it shows that although there are decreases in P in the past 5 years, particularly since the hurricane years, the levels in 2010 are still not back to the levels of a few decades ago when P averaged about 50 ug/L. Apparently in 2005 a hurricane mixed the sediment with the water column and TP was released which then slowly declined by sedimentation in the lake.

G. LAKE MONITORING AND RESEARCH

Submerged aquatic vegetation – The SAV biomass data need to be clarified. Are the areal figures based on calculations using the whole-lake area, the shoreline or littoral area, or just the area that containing SAV? The increase in areal coverage is good, although it is in part due to invasive species.

Emergent aquatic vegetation -

What is the P removal potential of harvesting rather than killing and recycling the torpedo grass? This could also minimize loss of non-target species such as bulrush.

Periphyton – The periphyton studies are comprehensive. What is their overall objective? Is periphyton anticipated to be a critical part of the food web here? Periphyton levels were lower in the period 2002-2006 than in prior years and a number of explanations are given for this. Is it also possible that toxicity of surfactants in agricultural runoff and in the chemicals used for SAV and emergent treatment are also a factor?

There are a number of periphyton indices, mostly based on diatom composition, that are used as indicators of water quality. It might be useful to calculate and track these indices, i.e. add one to the performance measures.

Macroinvertebrates – Efforts focused on a key species, the Florida Apple Snail. The results of stocking are promising as is the overall improvement in species richness and in diversity.

Fish – Fish have shown very good recovery with the exception of black crappie. Given the feeding habits of the black crappie, I think that it can be expected that recovery will be delayed until a healthier zooplankton population exists, as the authors suggest.

Habitat use by macroinvertebrates and fish – A detailed investigation of macroinvertebrates and fish at the edge of the littoral zone is reported. The study focused on habitat type and provides useful information about plant type and plant density that should be used to guide other aspects of the plan such as where (and how much) to undertake SAV control. I agree that longer-term studies on this topic are needed and that this sampling program should continue on a regular, perhaps annual, basis.

Herpetofauna – It is most unfortunate that there are few earlier studies given the problem with introduced species. Nevertheless, the information reported here is a start; it is important that these surveys continue annually.

p. 94 – too many significant figures

Wading birds – The wading bird populations apparently relate to water level and water level fluctuations more than to any other parameter. The improvements in water level management should help to stabilize populations, although major climate-related events such as drought and hurricanes can offset gains. While these events can never be completely countered, it is important to have a water management plan that can minimize the effects of such events.

H. IN-LAKE MANAGEMENT

An earlier study demonstrated that dredging would be ineffective in terms of controlling internal P loads. What has been investigated in terms of chemical treatment? Is there a report on the potential for chemical treatment?

Scraping away surficial muck or mixing it with sub-sediments in an area where sediments were exposed during a drought was investigated. Although the results don't seem totally conclusive, there were indications that the coverage with cattail declined and that fish habitat improved. This type of manipulation could be considered for future opportunistic use, although it seems unlikely that the coverage will ever be great. Longer term studies should also be conducted to make certain that there aren't subsequent deleterious effects.

I. LAKE ISTOKPOGA

This upstream lake has excessive Hydrilla, an exotic SAV. Again, control here by harvesting might ultimately reduce downstream flux of nutrients.

J. CONCLUSIONS

Although not explicitly stated, the conclusions recognize clearly that reduction of the P load to 140 tons by 2014 is not possible. There are positive signs in terms of the lake's recovery, and there are positive results in terms of many kinds of remedial activities, but many of these are still in the experimental stage and cannot be implemented on a broad basis in time to achieve the target load. In addition, the internal storage of P may counteract many of the reductions in external input for many years.

The major piece that I would like to see in this report is an estimate of what could potentially be achieved by each of these approaches if they were widely implemented. Could this ultimately lead to 140 tons?

ACCOUNTABILITY REVIEW

Chapter 10 is intended to comprise the 11th annual report to the Florida legislature required by the Lake Okeechobee Protection Program and Northern Everglades legislation through Section 373.4595, Florida Statutes. The purpose of the chapter is to provide an introduction to all programs being undertaken in the lake and its watershed and to include updated findings on monitoring, research, and regulatory activities.

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

The report presents a defensible account of recent data and findings of the very broad range of topics that are addressed under the Lake Okeechobee Protection Program. There are numerous suggestions in the technical review (above) for additional work, but they do not negate in any way the value of the work that has been done. The issue of the accumulation of phosphorus in sediments that in the future could become a serious threat needs to be addressed more thoroughly in future reports. Similarly, a detailed plan describing how the various management steps can lead to meeting the target load is needed.

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

This chapter reads well and is also well organized but the picture of the lake water quality and ecology is not good.

Are findings linked to management and objectives?

Yes, they are linked but so far findings are relatively discouraging and attainment of the objectives at the present pace may not happen unless BMPs and other measures are accelerated.

PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2011 SFER – VOLUME I, CHAPTER 11

Level of Panel Review: Technical (primary); Integrative (secondary)
Reviewers: V. Singh (AA), P. Dillon (A)

Posted: 09/08/10 at 01:21 PM by V. Singh

This chapter is well written, well organized and well presented. There are, however, a few comments for purposes of further strengthening the chapter.

1. Chapter title: The title does not reflect the contents in the chapter. Therefore, I suggest that the title of the chapter should be changed to more accurately reflect its contents.

2. I think a short abstract will be useful. The summary as such is too long.

3. It will be desirable to have a section on basin morphology, since it has a direct impact on surface flows and water management. This section may also include a discussion of the vadose zone or it may be included in the section on lithology proposed below.

4. It will also be desirable to have a section on basin lithology, since it directly impacts groundwater flow, recharge and pumping, amongst other things.

5. The chapter organization needs be changed a little bit, for example, on page 11-5, third paragraph, the chapter organization is outlined but thereafter the text does not follow this organization.

6. I find that sections, in general, are long. It may be helpful to divide the sections into sub-sections.

In summary, the authors have done a commendable job and their writing is clear. Addressing the above comments will make the chapter even stronger, I believe.

Posted: 09/16/10 at 03:24 PM by P. Dillon

Although the work reported here is primarily technical in nature, there is an important integrative component to this chapter. The overall goals of the work in the Kissimmee Basin are clear and the work described throughout this chapter for the most part is clearly linked to these goals.

General Comments

This chapter is well-written. The writing is clear and concise and easy to read. For the most part, it is organized in a logical fashion. However, the section on Kissimmee Basin Hydrological Conditions doesn't fit well the overall chapter structure (see suggestions below).

Technically, I think that the interpretations are sound. There are a number of instances where I think additional data would have been beneficial, but there are no places where I question the interpretation of the existing data.

Introduction and Background

This is a very good introduction to the chapter and to the work being undertaken in the Kissimmee Basin. The maps are clear and very helpful.

The scale of the construction project undertaken here is immense, basically the re-creation of an entire landscape. There are data presented subsequently and some discussion of the interim results of this overall project, but it would be useful in the Introduction to give an overview of what both the benefits and the downside of this construction work might be. The overall general objective is clear, and the 25 performance measures mentioned here are probably clearly described in other reports (some, but not all, are discussed in a later portion of the chapter), but I would like to see an overview of the expected benefits with a timeline, and more importantly, an overview of the potential negative effects and what is being done to evaluate them. For example, is there a possibility that construction will result in increased flux of pesticides/herbicides from the canal/river beds? Will phosphorus be mobilized resulting in a short-term increase in flux downstream?

p. 8 – I have a small issue with the units. Usually (but not always, e.g. l 252) this chapter reports in both metric and imperial units. I would rather see only metric but if this is not acceptable, then include both units with all numbers, not just some of them.

p. 9 – change hectare-m to m^3

Cross Watershed Activities

Recognition of the importance of the hydrological connectivity between regions appears to be a cornerstone of the program – this is highly commendable. Clearly, the future will be challenging, with anticipated population growth leading to reaching an early limit on use of sustainable water resources. The reservation of water quantities for the protection of fish and wildlife is a very positive step.

The extent of the overall problem of eutrophication in the system is made very clear in this section. The phosphorus load from this major tributary of Lake Okeechobee represents about 30% of the total load but also happens to be the maximum allowable load for achievement of the lake's water quality objectives. Although there is discussion of improved trapping of P in the floodplain and the riverbed once the construction phases are complete, there is no clear indication of how much reduction in P flux can be expected. I don't think that it is realistic to expect anything close to 70% reduction; I'm sure that this is not anticipated and that the many other remedial actions (BMPs, STAs) taken will contribute, but I would like to see an estimate of what can be achieved through this major alteration.

p. 16 – it would be helpful to quote the P flux or export figures in more standard units – $mg/m^2/yr$ – for comparison with the scientific literature

Kissimmee Basin Hydrologic Conditions

Title – should it not be Water Year 2010?

This section is straightforward although I'm not sure why it is here. Could these data not be included as part of the Project Updates, or is this general background material

Project Updates

The updates from the Phase I Monitoring Studies are very useful. The first portion, on hydrology, is particularly well-presented with reference back to the specific expectations. I would prefer to see the whole section in this format because of the ease in following progress.

Hydrology – Although all expectations have not been fully met, progress has been good and it seems as though things are on track.

Oxygen – Likewise with the oxygen expectations, they have not all been met but progress seems good. It is not ideal to be lacking true control ("before") data, but the authors have done everything that could be expected to make up for this by selecting comparable study sites out of the watershed.

Phosphorus – These data are critical to the success of the remediation efforts. There are promising changes in phosphorus; however, the importance of hydrology is clearly shown, with major significant events such as hurricanes overriding all other factors. This will make it difficult to evaluate trends without many years of data collection. I am presuming that monitoring will continue for the foreseeable future to allow such analyses. There is considerable focus placed on the new floodplain attenuating phosphorus; if soil data are available for the region that will be flooded, then perhaps P adsorption capacity could be calculated and the P retention capacity of the new floodplain crudely estimated and reported here. In terms of P retention by biological reactions (e.g. plant growth), followed by sediment accumulation, this is not an effective P sink in north-temperate regions. Wetlands accumulate P in the growing seasonal but where there are cold winters and plant mortality, almost all of the P (and N) retained in the growing season is flushed out of the system in the winter and spring following decay of the plant material. In Florida with no cold winter, this may be otherwise, but it would be useful to see some documentation relating to the possible success of this pathway in controlling P fluxes.

Floodplain vegetation – Again, the improvements are positive. Is there any prospect of reducing the P in the system by mechanical harvesting of the non-desirable types of plant communities? This has been done in other jurisdictions as a P control measure. With estimates of biomass and P content, this should be easy.

Aquatic invertebrates – Again, results to date are promising, although I would like to see more comprehensive data that don't focus so heavily on mollusks.

Wading birds – Although most of the targets haven't been met, at least things are going in the right direction. The residual effects of previous hurricanes seem significant.

Phase II/III Restoration Evaluation – The proposals for additional monitoring are sound although I expected a more comprehensive suite of chemical parameters including nitrogen, suspended sediments, metals and trace organics.

Geomorphology – This is a strong section that presents a comprehensive approach.

Kissimmee Basin Modeling and Operations Study – This section is too sketchy to be able to evaluate what is going to be done.

PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2011 SFER – VOLUME I, CHAPTER 12

Level of Panel Review: Technical (primary); Integrative (secondary)
Reviewers: J. Burkholder (AA), J. Burger (A)

Posted: 09/16/10 at 10:01 PM by J. Burkholder

Has an evaluation been completed to assess how the Arthur R. Marshall Loxahatchee National Wildlife Refuge will be affected by routing urban runoff into it? (p.12-62) Similarly, has an evaluation been completed to assess how the receiving wetlands in the Biscayne Bay Coastal Wetlands Project will be affected by the canal water inputs? (p.12-78)

What is known about the freshwater macroalgal consortium in the Florida Bay system? The primary focus of the MFL rule and of recent research in Florida Bay includes this consortium (p.12-106), so it clearly is important to restoration efforts in that ecosystem and inclusion of summary information about it would be helpful.

The winter cold snap in Florida Bay was described to have adversely affected roseate spoonbills (lines 2175+), but were other colonial breeding species also affected? Why didn't crocodiles escape the lower temperatures (lines 2168+)? – And, did individuals of a certain size or age mostly die from the cold stress?

The subsection on Naples Bay (p.12-127) stated that stratification problems are believed to have increased in the upper bay, and that the Golden Gate Weir 3 Improvements project should improve that situation. Are there plans to assess stratification in this system? It would seem that such information would be helpful in evaluating the effects of this project in the District's restoration efforts.

Only one activity – provision of six water quality and flow monitoring stations in the Ten Thousand Islands – is mentioned in plans for future Western Estuary activities (p.12-127). Is this the only activity being planned? As examples, what about continued efforts to evaluate Eastern oysters as a VEC in the Western Estuaries, or monitoring efforts to assess restoration success in the bullets mentioned on p.12-119?

The Coastal Ecosystem Division's Science Plan, which the panel was requested to review as part of the 2008 SFER, was not mentioned. It originally was described as the overarching approach being used to guide the research, management, and restoration of the District's coastal systems. What is the present status of this plan?

General Comments

Chapter 12 has been completely restructured in the 2011 SFER, relative to previous years. Gone is the separate consideration of 8-9 coastal ecosystems; instead the coastal systems are separated into four regions and discussed by region. The basis for this change is the authors' clearer focus on "the coastal water bodies where the District has focused its work efforts…to assess the impact of these efforts on the estuaries" (lines 6-7). In addition, a major focus is the monitoring and research activities related to the Caloosahatchee River Watershed Protection Plan (CRWPP) and the St. Lucie River Watershed Protection Plan (SLRWPP). The Northern Estuaries section also represents the annual report for the CRWPP and SLRWPP required by the Florida Legislature. The restructuring greatly improves the chapter and also reveals where most District efforts are focused, reflected by the number of pages devoted to each region – 42 pp. each for the Northern and Southern Estuaries, 27 pp. for the Eastern Estuaries, and only 18 pp. for the Western Estuaries.

Major concerns across the coastal ecosystems are identified as the timing/volume of freshwater flow, and water quality degradation from watershed urbanization. The history of human alterations of these systems and their watersheds is explained in compelling writing for each of the four regions. The basis for the District's approach in efforts to improve protection of the coastal ecosystems is also nicely explained (p.12-2, lines 56-70). Throughout the chapter, the maps are excellent and helpful and, in general, the chapter's organization and writing are greatly improved over last year's version, although the quality of the technical content and its presentation differs markedly in the discussions of these four regions. The important Summary section, unfortunately, is an exception to this improvement: While some chapters of the 2011 SFER (e.g. Chapters 6 and 9) contain excellent Summary sections that provide a clear understanding of what was accomplished in WY2011, Chapter 12's Summary is weak. It does not adequately convey the District's efforts and accomplishments in each of the four regions.

It also seems remarkable, given the regional restructuring of the chapter, that no comparative information is provided about estuaries *across* the regions – general status by region, major issues, etc. Such an overall, integrative synthesis is needed as an ending section to this chapter, and its major points should be briefly presented in the Summary. It would also be helpful, as Chapter 6 has nicely done, to include a section about nonindigenous invasive species in the four regions – Chapter 12 would be a great place to pull together information known about how these species are affecting the estuaries. Finally, the subsection, Future Activities, is very important and should be strengthened in most of the regional sections (exception, Northern Estuaries). The present writing does not do the District justice because it does not capture [even] the major activities that the District will both be initiating and continuing to conduct toward its goal of restoring the Coastal Ecosystems.

Technical Review

Technical review is appropriate for this chapter because there is a major research component and new data are being analyzed for unique interpretation. The District's guidance on technical review has been that methodological details should continue to be reported along with explanations of new findings, and that the following questions should be considered in the evaluation:

▪ Are the findings and conclusions supported by "best available information", or are there gaps or flaws in the information presented?

▪ Are there other interpretations of the data and other available information that should be considered by the authors and presented to decision makers? If so, what specific studies should be addressed or what available data support alternative findings?

The panel's overall evaluation is that this draft chapter is mixed in its data presentation; for some studies – but not for others – a clear, defensible account of data and findings is presented, and the findings and conclusions were supported by "best available information." Thus, some parts of the writing are excellent, while in other places, it is not possible to evaluate technical merit because insufficient information is given, or the findings are not clearly described and also are not clearly linked to management goals and objectives. Certain sections frequently invoke "trends" in the data but do not indicate whether supporting statistical analyses were performed; and even brief descriptions of approach/sampling programs are not included for some monitoring data presented – again, preventing technical evaluation. Troubling errors in "combining" seagrasses and macroalgae together (see below) seriously confound the interpretations about the seagrass performance indicator in [at least] two of the four major sections. If not corrected (i.e. if macroalgae + seagrasses are combined as SAV), the data collected will be of little use in evaluating this important performance indicator. These problems should be corrected to strengthen this chapter, which represents many excellent efforts by the District and which contains a wealth of valuable information about these important coastal systems. Comments by region are as follows:

Northern Estuaries

(St. Lucie River Estuary [SLE], Southern Indian River Lagoon [SIRL], Caloosahatchee River Estuary [CRE], and Southern Charlotte Harbor) This section has a helpful introduction that includes a synopsis of major projects and issues. It was especially encouraging to learn (p.12-9) that the District initiated development of regulatory nutrient source control programs for each river watershed in response to NEEPP (Northern Everglades and Estuaries Protection Program) legislation. The St. Lucie Estuary nutrient budget study was very informative in its comparison of internal (sediment efflux) versus external nitrogen loading. Similar findings were reported from a nutrient budget study in the Caloosahatchee Estuary (p.12-11). The Integrated Modeling Framework information for the St. Lucie Estuary (p.12-11) listed tasks but should also provide information about the approach (bullets 2-4) and outcomes of those tasks in order to enable technical evaluation. Apparently a similar effort (p.12-12, lines 437-443) is being undertaken for the Caloosahatchee Tidal Basin, and should yield valuable information. It is impressive that the recalibrated CH3D salinity/hydrodynamic model is now capable of simulating a 41-year period of record, but it would be helpful to add more information about the simulations. The preliminary findings from the Low Salinity Zone project (pp.12-11 to 12-12) are interesting and of potential value to restoration efforts. Information should be added about the projected date for completion of the data analyses.

The Ecosystem status section contains a nice history of the St. Lucie River Estuary / Southern Indian River Lagoon and the Caloosahatchee Estuary / Southern Charlotte Harbor, and clear, helpful descriptions of salinity, freshwater inflows (e.g. Figure 12-17, excellent), and minimum flow levels (MFLs) where established. It is unfortunate that there are only three years of data on live/dead oyster densities thus far for the St. Lucie Estuary (Figure 12-14 and related text), and only ~seven years of data are available from comprehensive monitoring of oysters in the Caloosahatchee (p.12-44), and it will be valuable to continue those monitoring efforts. An important inference reported about the North Fork of the Loxahatchee ecosystem is that opening

berms and restoring the hydroperiod to floodplain areas may be a problem in the upper tidal reach of the river if freshwater flow is not available to maintain low salinity levels in the river channel. Important questions are to be addressed through the development of a coastal environmental operations program (p.12-46), planned to continue in WY2011, and it will be exciting to obtain that information.

Other specific comments:

P.12-4, lines 115-116 (nutrient enrichment is believed to cause phytoplankton blooms, which impact submersed aquatic vegetation) - The problems with this writing are that (i) nutrient enrichment has been shown to cause phytoplankton blooms in tidal freshwaters and estuaries worldwide, including Florida waters (e.g. see p.12-75); and (ii) phytoplankton blooms have an array of impacts, not only adverse effects on SAV. Please restructure this writing and add supporting references.

P.12-8, line 263 - more information on the Gopher tortoise relocation program should be provided or referred to (numbers, locations, success).

P.12-10, lines 356-360 - It is not clear as to why this study was reported, considering that it was conducted in WY2009 and the major findings were summarized in last year's SFER.

P.12-11, lines 391-394 - Please clarify when the data analysis will be completed.

P.12-11, lines 399+ - Please briefly explain what consideration is being given to making upstream movement possible so that these populations are not restricted.

P.12-12, lines 424-425 - This statement is inaccurate because nutrient load reduction also can influence total organic carbon which, in turn, can influence light availability.

P.12-14, line 474 - Some reference to the past oyster research would be helpful here.

P.12-15, Table 12-1 - Please clarify; the panel assumes that data are not *yet* available for TN and TP loadings from Lake Okeechobee, but will be provided?

P.12-17, lines 542-545 - Additional explanation is needed about the differences between the TN and TP loads relative to flow.

P.12-17, lines 546-553 - Much more information is needed to enable technical evaluation: the authors should explain why only one station was "chosen" to represent conditions in WY2009, WY2010, and mean conditions during the period of record from WY1997 - WY2008. They should also explain the basis of that selection, and how they determined that the station selected was "representative" of the others.

P.12-17, lines 557-558 - Please add information about the maximum chlorophyll *a* concentration of this bloom and, if available, the dominant taxa involved.

P.12-18 - Annual nutrient loads are described as "clearly lower" in WY2010 than WY2009, and overall nutrient and chl*a* concentrations as low in comparison to both WY2009 and the long-term average. However, no statistical analyses supporting these statements are indicated. It would be helpful to add such information (e.g. *p* values) in Table 12-2 (p.12-19). If such analyses have not been done, then the authors should clarify that point.

P.12-22, lines 587-588 – This statement, "SAV can also include benthic macroalgae" must be omitted, and the combining of seagrasses and macroalgae as SAV in this section and in the section on the Southern Estuaries (specifically, the subsection on Florida Bay) must be changed, for three reasons: (i) SAV refers to submersed vascular plants, not macroalgae, in nearly all of the published literature (the correct term is submersed, not submerged – see Wetzel (2001, *Limnology*). (ii) The "lumping together" of seagrasses and macroalgae in presenting SAV information conveys serious misinformation because the marine macroalgae mentioned are *not* indicators of good ecosystem health. Instead, macroalgae commonly are indicators of excessive

nutrient pollution (e.g. see p.12-81 and Biber 2002), and under such conditions they typically overgrow and kill seagrass meadows. (iii) Seagrasses – ***not*** seagrasses+macroalgae – are an important VEC in evaluating the District's restoration efforts. Therefore, seagrasses must be considered separately from macroalgae in any analysis of SAV. If the information reported from aerial photos ("lagoon-wide SAV mapping, line 606) also considered macroalgae, it is not scientifically valid to report it as "seagrass acreage" (line 614) and this text (and Figure 12-9 legend; Figure 12-10 SAV segments vs. seagrass management segments) must be adjusted accordingly. Also see additional comments about this in the Florida Bay subsection, below.

P.12-25, Figure 12-11 - This figure contains no data. Also, please clarify that the data, when added, are for seagrasses (i.e. that SAV means seagrasses and *not* seagrasses + macroalgae).

P.12-25, line 643+ - The relationship among the three seagrasses seems critical to overall system health; was consideration also given to the associated fauna involved (or their effects)?

P.12-25, line 644 - Please clarify whether the various methods have been intercalibrated.

P.12-28, line 669+ - Briefly indicate where recruitment might be coming from, given that at some points there appears (from the graph) to be few live oysters.

P.12-28, lines 672-673 - Oysters have also declined in South Florida estuaries because of water quality degradation; please clarify.

P.12-28, lines 679-680 - The statistical analysis supporting this statement needs to be added or, if statistics were not performed, then that should be clarified and the writing should be altered accordingly.

P.12-29, line 694 - The authors should define a "pre-taxonomic survey."

P.12-29, line 698 - The basis for defining "facultative wet" and "obligate taxa should be added, with supporting reference.

P.12-30, Table 12-3 - Should add summary information for invasive species.

P.12-31, line 767 - …1998). A MFL… P.12-31, line 775 - …2009)…

P.12-37, line 863 - This is very high TN, and the spike appeared to coincide with a major TP spike as well (Figure 12-22). Please add explanation.

Figures 12-22, 12-23 - Clarify whether statistical analyses have been conducted to examine relationships between TN, TP, and chlorophyll *a*; if so, please include the summary information.

P.12-41, line 897 - Explain more clearly 1-100 m.

Eastern Estuaries

(Loxahatchee River Estuary, Lake Worth Lagoon, and estuaries along the Intracoastal Waterway in Broward County)

The status of the Loxahatchee River and its estuary was clearly explained; the Northwest Fork's excellent restoration plan (completed in 2006) has focused much-needed attention on this important system. This plan identified five VECs (valued ecosystem components), including (p.12-49) cypress swamp and hydric hammock in the freshwater riverine floodplain, cypress swamp in the tidal floodplain, fish larvae in the low-salinity zone, oysters in the mesohaline zone, and seagrasses in the polyhaline zone downstream. Figure 12-31 is nicely designed and very helpful, and accompanying text (p.12-50) explains how the troubling problems in the distribution, delivery, and timing of freshwater flow will be/are being alleviated by the District's restoration efforts. VECs mentioned for Lake Worth Lagoon (p.12-62) include Eastern oysters and seagrasses such as the key species Johnson's seagrass. The information presented on future

eastern region activities (p.12-74) is helpful and the studies mentioned will add valuable data for the restoration effort.

P.12-55, Figure 12-35 legend, or p.12-53 - For technical evaluation, explanation should be added about how the two methods used to track seagrass cover (transect vs. patch-quad) compare, and whether the methods have been cross-calibrated. Note: Figure 12-35 is nicely designed, and SEs are helpful in interpreting the data.

P.12-56, line 1158 - Using the same form for the figures throughout is helpful. There seems to be less variation in the live oysters than in the northern estuaries - any explanation/comment?

P.12-57, Floodplain Vegetation section - Please explain the expected results of this change in canopy, and the prognosis.

P.12-57, lines 1167-1168 - Is a very interesting observation. Information should be added about nonindigenous species, with cross-reference to Chapter 9.

P.12-57, lines 1180-1189 - These percent changes seem too small to be significant, except perhaps for mangroves. Have the data been statistically analyzed? - clarification of this point is needed.

P.12-58, Table 12-8 footnotes - The basis for defining facultative wet, obligate etc. should be added, with supporting reference.

P.12-59, Table 12-9 legend - The amount of area surveyed and the general locations (systems) should be added.

P.12-60, Lake Worth Lagoon - Conspicuously missing from the description of this system is the extensive urbanization of the watershed; please include information about this (e.g. percentages of watershed in high-density / low density development considering each of the three segments shown in Figure 12-38). Clearly this information is available (e.g. p.12-61, line 1225).

P.12-62, lines 1226-1233 - These data should be shown (e.g. TKN concentrations, annual loads from each canal). Data on suspended solids and/or turbidity should also be shown (lines 1234-1235; concentrations, as well as loading ranges that are shown in Table 12-10 and Figure 12-43 – thus far, no data have been shown for this important parameter in WY2010), and the differences in macroinvertebrate community structure should be described (lines 1236-1238). Also (line 1238), is it the velocity, or also the amount and timing (seasonally)?

P.12-62, lines 1245-1252 - There is no mention of toxic substances, which surely must be affecting this ecosystem that is receiving inputs from a heavily urbanized watershed. Toxic substances should be included in this writing; readers should be informed about their general significance and about the availability of data, if any, on this important group of parameters in Lake Worth Lagoon (sediments etc.).

P.12-65, line 1288 - Explain how the Lake Worth Lagoon water quality monitoring program was revamped. Lines 1288-1293 and accompanying figures - Please clarify whether TKN is being measured and, if so, add information about this important parameter.

P.12-66 - As important information needed to interpret the writing (and Figures 12-45 and 12-46), the authors should describe how these seagrass species differ in their general response to light, nutrients and salinity, with supporting references.

P.12-70 - Add more information to describe the oyster monitoring program (number of sites? statistical analysis of oysters vs. salinity? sampled once in the wet season and once in the dry season each year since 2005? etc.).

P.12-71 - Explanation is needed about why the North Fork of the New River Estuary is important in District restoration efforts. State the years encompassing the county's monitoring program, and the number of sites (information is provided for only one site, site 16 - why was only that site

highlighted?). Line 1401 - Has statistical trend analysis been conducted? Please clarify. If not, the writing should be altered: …may be continuing an apparent trend downward.

P.12-74, lines 1422-1431 - Please clarify whether there are there statistical analyses to support any of this discussion. Where low-frequency data are described (e.g. quarterly or twice per year), medians should also be discussed.

P.12-74, lines 1452-1452 - Phase 2 of the Acme Basin B Discharge Project should be described so that readers understand its purpose in the restoration effort - what it is intended to accomplish.

Southern Estuaries

(Biscayne Bay, the Florida Keys, Florida Bay, and the Ten Thousands Islands Estuary within the Everglades National Park)

Much of this section is excellent, as in previous SFERs. The descriptions that are included for the Biscayne Bay and Florida Bay ecosystems are generally well written and clear. The most extensive information is provided for Florida Bay; that subsection highlights results from major monitoring projects and encompasses hydrologic and salinity conditions, water quality, seagrass habitat, upper trophic levels (fish, roseate spoonbills), and an update on research and modeling activities related to District management and restoration efforts. The presentation of water quality information was improved this year to include information on the variance around the means for selected parameters. The apparent success story of Lake Surprise is encouraging (an example of a point that should be mentioned in the Summary of this chapter). The projects described in the Applied Synthesis subsection (Minimum Flows and Levels for Florida Bay, Synoptic Mapping of Water Quality, C-111 Spreader Canal Western Project, and Central Lakes Region Sediment-Water Nutrient Fluxes, Florida Bay Ecosystem Assessment Indicators, and Modeling Synthesis) are all highly meritorious and will yield valuable information toward restoration assessment. The Modeling Synthesis effort is exciting in the forecasting power it will bring to the District's restoration efforts.

P.12-75, line 1476 - Should state what these three success indicators are, and the restoration goals.

P.12-76, line 1492 - List the main agricultural practices.

P.12-76, line 1502 - Is salinity still increasing? Please clarify.

P.12-76, lines 1511-1520 - Nice summary of biota and uses.

P.12-76, last paragraph - Please explain where the water will be diverted to (line 1527), and whether projected impacts on the receiving area have been evaluated.

P.12-77, Figure 12-50 legend - Please add information about who maintains these stations / parameters monitored/ frequency.

P.12-78, line 1536 - Briefly state what the success indicators are.

P.12-78, lines1565-1566 - Is this statement supported by statistical analysis? Please clarify and, if so, add the statistical information.

P.12-78, lines 1569-1570 versus Figure 12-52 legend - Are in conflict; which is correct?

P.12-78, line 1574 - Clarify which two canals.

P.12-78, lines 1575-1576 - Briefly explain why the data are missing.

P.12-81 - Include brief explanation about the apparent decline of macroalgae shown in Figure 12-81.

P.12-81, Figure 12-81 legend - Change to: Mean percentage of cover of macroalgae and seagrasses [or macroalgae and SAV]…

P.12-82, line 1621 - It might be useful to include some numbers for live/dead oysters for those areas surveyed, rather than using terms like "small numbers."

P.12-83, 1st paragraph - also needs to mention increased nutrients as an important factor (as reported, for example, in the 2006 SFER).

P.12-83, line 1666 - Change to: covered mostly by seagrasses along with some macroalgae. The seagrasses provide beneficial habitat…

P.12-93, 1st paragraph - Should include a brief description of the CERP performance measures for Florida Bay and the other southern coastal ecosystems. While it is true that information on the status and trends of water quality in Florida Bay can be found in previous SFERs, a brief synopsis of that information should also be included here.

P.12-93, lines 1894-1895 - Is there any explanation for the exceptionally high ammonium peak? Please clarify.

P.12-97, line 1944+ - The authors should more clearly state the factors that have been linked to causing the bloom.

Pp.12-98 to 12-103 – Understanding changes in seagrasses and macroalgae, and effects on higher trophic levels, is laudable and key to bay assessment. However, this writing is a major problem in describing SAV and macrophytes as including macroalgae and seagrasses, considered collectively. SAV and macrophytes are terms that should be reserved for seagrasses (submersed vascular plants) for the reasons stated above (see pp.3-4 of these comments). Seagrasses, not seagrasses+macroalgae, are a VEC in District restoration efforts. Thus, the authors misstate (p.12-102, lines 2064-2065) that "The status of SAV habitat is the central performance measure for Florida Bay assessment and restoration (Rudnick et al. 2005)," and they misquote the reference cited: Importantly, the Rudnick et al. assessment dealt exclusively with seagrasses, just as the VEC for SAV is exclusive to seagrasses (also see Madden et al. 2009 - seagrass indicator metrics, mentioned on p.12-114) - it does not, and should not, include macroalgae. It is important that the writing throughout these pages is altered accordingly.

P.12-98, line 2006 - Describes a trend of increasing seagrass. Is this statement supported by statistical analysis? If so, the information should be added. If not, the writing should be changed to: Of particular interest was an apparent increase in…

P.12-101, line 2050+ - The authors erroneously state that "SAV is recruiting well on the cap footprint" because most of the recruitment is from macroalgae, not seagrasses, and seagrasses are the beneficial species that will need to be transplanted. The authors' description of "at least one species present in 97.3% of observed quadrats," coupled with their observation that macroalgae were more frequent and in higher density than seagrass, indicate the opposite of what they assert: Seagrasses are ***not*** recruiting well and seagrass transplanting will clearly be needed. This writing illustrates the serious problem created by "combining" macroalgae as "beneficial SAV." It is important that the writing is altered, accordingly.

P.2104, line 2158+ - Please clarify whether the invasive species appear to be recovering faster than the native species.

P.12-106, lines 2223-2224; and p.12-107, line - *Ruppia* is not a freshwater species (e.g. see p.12-108, lines 2260-2261); please alter this wording.

P.12-110 - Please add information about the sampling frequency and parameters involved in the C-111 Spreader Canal Western Project, which clearly has produced some exciting, high-frequency data (e.g. Figure 12-77).

Pp.12-114- 12-115 - The use of these indicators is excellent, both in terms of continuous monitoring and for public/policy use. Please check to ensure that SAV here refers to seagrasses and not seagrasses+ macroalgae. A data summary (figure or table) for the important Target Species Index information described here should be included.

Western Estuaries

(Estero Bay, Naples Bay, Rookery Bay, and Fakahatchee Estuary)

This region continues to be is under-emphasized in comparison to the others, but it is being addressed through three important District projects - the Picayune Strand Restoration Project, the Picayune Strand Water Reservation, and the Golden Gate Weir No. 3 Relocation. The purpose of each and its significance to District restoration efforts are clearly described. The areas mentioned in the introductory paragraph (p.12-118) need to be shown in an accompanying map. The second paragraph (lines 2511-2518) should be expanded to provide more description of water quality degradation and habitat decline/loss in the Fakahatchee Estuary. An expanded description for Naples Bay (p.12-124) is also needed, including a brief synopsis of the data available for this system.

The extreme salinity range mentioned for Pumpkin Bay (p.12-120), and the number of days when salinity exceeded 25 for Eastern oyster habitat in Faka Union Bay (p.12-122), are troubling and indicate that the District's efforts are sorely needed to help restore these systems.

P.12-119, lines 2554-2566 - This list is very useful (and other sections of the chapters could use this approach).

P.12-122, lines 2602-2603 - Please explain the large range in flows for the Faka Union Canal Water Reservation.

P.12-123, lines 2646-2667 - Were statistical analyses conducted to assess whether the described differences were significant? Please clarify and add the statistical information if available (as nicely done on p.12-124).

P.12-125, Figure 12-84 legend - Include information about the two stations shown (why in this location? depth of Naples Bay in this location? monitored for what? how frequently? by whom?).

Integrative Review

Secondary review of Chapter 12 at the Integrative level is appropriate because the ubiquitous distribution of estuaries along the Florida coast and the integrative response of estuarine water quality and biota to the inflows of freshwater. This level of review should evaluate how well the chapter provides integrated summaries of information, and it can also evaluate cross-cutting themes and the connections between research and water projects. Questions that have been recommended by the District for consideration in integrative review are:

- Are large programs presented so that the overall goals are clear and linked systematically to descriptions across the Report?
- Is the chapter cross-referenced in a thorough and consistent manner? and,
- Can constructive criticism and guidance be contributed for the District's large-scale programs?

Chapter 12 falls short on integration among the sections; unfortunately, there is little integration throughout the writing, even within sections (i.e. within a region). The overall purpose of some of the studies described was unclear, and no attempts were made to integrate them in most sections, the Florida Bay subsection being the notable exception.

The chapter also minimally cross-references other chapters. Figure 12-2 does provide a nice overview directing readers to chapters containing information about the NEEPP. Other chapters are also mentioned elsewhere but very infrequently (pp.12-7, 12-76, 12-119 - Chapter 7). Many opportunities for integration with other chapters are missed (e.g. p.12-5, no mention of Chapter 7; p.12-29, 23 invasive species mentioned that were 14% of the total transect flora, but no reference to Chapter 9; pp.12-34 and 12-45, Lake Okeechobee regulation schedule, but no reference to

Chapter 10; p.12-57, lines 1167-1168, about invasive species, without cross-reference to Chapter 9).

Chapter 12 should be strengthened by adding a section that provides some integration among the four regions by assessing overall patterns in VECs (e.g. seagrasses, oysters), freshwater flows, nonindigenous invasive species, and water quality, explaining how they tie together. Improved integration of this chapter with others – since, after all, the coastal estuaries are the downstream endpoint of District restoration activities – should also be done because it will significantly improve not only this chapter, but also the overall SFER.

Editorial / Other Content Changes

Throughout - The chapter varies in reporting of means versus medians (e.g. nice information on pp.12-93 and 12-94). Both are helpful (with SEs included for means), and both should be provided consistently where possible.

Throughout the chapter - The authors should consider omitting units for salinity; practical salinity is the ratio of two electrical conductivities and is dimensionless.

Practical salinity (S) = the ratio (K15),

$$\frac{\text{electrical conductivity of the sample at 15oC and pressure of 1 standard atmosphere}}{\text{electrical conductivity of a KCl solution* at the same temperature and pressure}}$$

*wherein the mass fraction of KCl is 32.4356 x 10-3.

A K15 value of 1 corresponds to a Practical Salinity value of 35.

[Also note that the chapter inconsistently reports units as psu or PSU.]

P.1, line 31 - …and Eastern oyster…

P.1, lines 33-34 - Explain why this is a significant highlight.

P.2, line 60 - …Valued Ecosystem Components)…

Pp.12-20 to 12-21, Figures 12-7 and 12-8 - the keys are very difficult to read or cannot be read without a magnifying glass. The wording should be enlarged.

P.12-30, line 728 - …These data indicate [or suggest] that…

P.12-34, lines 816-817 - Mention is made of changes that will occur when C-43 is constructed; please add information on when completion is projected, here and throughout the writing (e.g. p.12-37, line 875;

p.12-42, line 931).

P.12-36, Table 12-6 - Percentages should be added.

P.12-36, Figure 12-20 - Additional information is needed in the legend (e.g. number of samples taken per year / sampling frequency).

Figures 12-22, 12-23 - Both figures need a key.

P.12-44, line 945 vs. P.12-45, line 973 - five stations or six stations?

P.12-50, lines 1090-1091; p.12-53, line 11129 - Add information about the projected date (year) when the L-8 Reservoir will become operational.

P.12-50, lines 1095-1104 - The River Keeper monitoring network seems impressive and valuable in the data it is contributing. Please add information about when the River Keeper monitoring network was initiated.

P.12-53, Figure 12-33 - The keys need to be enlarged, as they are barely readable. Please clarify in the legend whether replicate samples were taken.

P.12-53, lines 1121-1130 - This description is very "broad-brush;" it would be helpful to add interpretations, and to provide the wet-season and dry-season means + 1 SE and the medians. It is encouraging that the concentrations were comparable to the interim water quality targets for the Loxahatchee River and Northwest Fork.

P.12-53, lines 1134-1135 - The median salinity of the upstream and downstream sites should be added.

P.12-63, Figures 12-39, 12-40, 12-41 - Add information in the legends about the number of stations upon which these monthly means are based, and show standard errors (SEs).

Pp. 12-73 and 12-74 - Should be switched in order.

P.12-73, Table 12-11 - N values for each parameter in each of these time groupings should be added.

P.12-73, Figure 12-49 - Bar graphs should be depicted rather than lines, and SEs should be added with means.

P.12-75, line 1467 - …Historically (i.e.

P.12-75, line 1468 - …nearshore areas is believed…

P.12-81, line 1601 - …Shoal grass outcompetes…

P.12-82, 1st paragraph - Include the projected completion date for the Biscayne Bay Coastal Wetlands Project.

P.12-88, Figure 12-57 - Has a problem in conveying water years; change WY0 to WY09 and WY1 to WY10 throughout.

P.12-91, last paragraph - Should include a brief description of the MFL rule.

P.12-92, Figure 12-61 - Add SEs, and legend should include N values.

P.12-93, line 1872 - …and the other southern…

Pp.12-94 and 12-96, Figures 12-63 and 12-65 - Need to fix the WY designations (change to WY09 and WY10 as appropriate).

P.12-97, lines 1944, 1966, 1968 - change algae to algal

P.12-101, line 2054 - …macroalgae were observed…

P.12-106, line 2224 - …macroalgal consortium…

P.12-108, line 2258 - …in the mesocosm…

P.12-113, line 2388, "outbreaks of diatoms" - it is doubtful that these were harmful species, so it would be helpful to alter this wording.

P.12-120, Figure 12-82 legend - Include explanation of the station colors, and a brief synopsis of sampling duration and frequency at the stations shown.

P.12-120, line 2573 - Include the number of sites in Pumpkin Bay and Faka Union Bay (difficult to tell from

Figure 12-82).

P.12-121, Figure 12-83 - Include SEs for these means.

P.12-123, line 2659 - …in both estuaries….

P.12-100, Figure 12-68 legend - …macroalgal density…