Appendix 1A-7: Authors' Responses to the Peer Review Panel Report on the Draft *2008 South Florida Environmental Report – Volume I*

A panel of outside experts provided peer review of the *2008 South Florida Environmental Report* through WebBoard comments, participation in a two-and-one-half day public workshop, and a written final report (Appendix 1A-6). Authors revised their chapters and related appendices responsively. This appendix includes authors' responses to major comments and recommendations in the panel's final report. With the exception of reformatting some information for better readability, this appendix was not edited by the SFER production staff.

2008 SFER – Volume I Authors' Responses to Comments

Part I:
Responses to General SFER Comments and Specific Comments on Chapters

RESPONSES TO GENERAL REVIEW COMMENTS ON THE 2008 SFER

On pages 2 through 5 of the panel's final report, there are recommendations provided by the *2008 South Florida Environmental Report* (SFER) panel in the following four categories: (1) general panel response to the draft report, (2) agency-wide recommendations on programmatic and integrative issues, (3) recommendations on the 2009 SFER, and (4) thoughts on the 2009 cross-cutting theme. Agency responses to these general recommendations are provided below:

GENERAL PANEL RESPONSE TO THE DRAFT REPORT

Public Workshop and Peer-Review Process

The South Florida Water Management District (District) appreciates the panel's continued input on the SFER peer-review process. The panel's concept is excellent for the report authors to provide responses before the workshop. However, the recommendation for six days of panel review before the workshop with the planned schedule is really tight and may pose some challenges for authors to meet. Therefore, the District suggests that this timeline be flexible such that some of the panelists should expect to do their preparation for the workshop either a few days immediately before and/or during the workshop. We concur with the panel's overall suggestions on the proposed logistics of the peer review and public workshop process.

AGENCY-WIDE RECOMMENDATIONS ON PROGRAMMATIC AND INTEGRATIVE ISSUES

1. Reengineering of Water Quality Monitoring

The District agrees fully with the panel's support for the reengineering of water quality monitoring in South Florida, and we will continue to work both with an internal group and an interagency working group as the reengineering proceeds.

2. Information on Sulfur and Mercury

The District and the Florida Department of Environmental Protection (FDEP) will continue to collaborate with other organizations in developing and implementing the recommended research on sulfur and its linkage to the mercury problem. With the approval and prioritization of projects through agency management, we intend to implement the proposed projects recommended in Appendix 3B-2 and will modify our approaches to these projects as new, relevant information becomes available. Our overall approach is fully consistent with the panel's recommendations.

3. Development of Voluntary Sulfur Best Management Practices

While the District and the FDEP agree with the panel that voluntary Best Management Practices (BMPs) for sulfur reduction may well be needed, allocating resources to this area must await the results of the various research projects being done under the foregoing recommendation.

4. Integrated Research Planning

Initial science plans for the Everglades and Coastal Ecosystems were developed independently. A science plan for the Stormwater Treatment Areas has also been developed but not published. Similar plans were developed for the Kissimmee Watershed (peer-reviewed, published compendium, 2005) and Lake Okeechobee (Lake Okeechobee Protection Plan). Subsequent development and integration of these plans will be done under one process, beginning next year. This will improve consistency among the plans. Integration of plans may yield superior approaches to answering challenging management questions that span more than one regional ecosystem.

5. Integration of Performance Measures

The District agrees with the intent of this recommendation concerning the integration of performance measures across the various areas covered by the SFER. For the 2009 SFER, we intend to develop an internal team of SFER authors to work collaboratively with our agency's strategic planning staff to compile and expand performance measures to be used in each SFER chapter. It is expected that a summary of these performance measures and the processes used to develop them will also be presented in the 2009 SFER.

6. Total Maximum Daily Loads

The District and the FDEP completely agrees with the panel that the implementation of Total Maximum Daily Loads (TMDLs) will be challenging and may add serious complexity to environmental management. Any TMDLs that are finalized in the timeframe of the next water year will be discussed in the appropriate chapter(s) of the 2009 SFER – Volume I. However, the panel should recognize that the TMDL process is in its early stages in South Florida and a realistic appraisal of the impact of this regulatory framework cannot be achieved for several years.

7. Hydrological Information System

The District agrees with the panel's suggestion that hydrological monitoring be connected to hydrologic management information systems. It should be noted that this is currently the case, as hydrologic monitoring data is in the District's database systems including Telvant, DCVP, and DBHYDRO. These systems are connected physically and logically by existing data acquisition and archiving processes. In addition, the hydrologic monitoring network is optimized on continuing basis as new projects are planned and constructed and by period network optimization studies.

8. Kissimmee Basin Phosphorus Levels

The District agrees with the intent of this recommendation regarding increased phosphorus levels at the southern end of Lake Kissimmee confounding management goals. It should be noted that the difficulty in obtaining samples goes beyond inappropriate climatic conditions and involves District access to private property. Under current District policy, consent to sample waters on private property must be provided by the property owner, which has been denied for the area in question. An upcoming District program, Works of the District, will increase the jurisdictional boundaries allowed for sampling in the Kissimmee Chain of Lakes and will include this area, but is not planned for implementation until Fiscal Year 2009. District staff is emphasizing this work upon implementation of the Works of the District and it is expected that findings will be reported in future SFERs. Meanwhile, the District will continue working with the Florida Department of Agriculture and Consumer Services and the landowner on voluntary solutions to reduce possible phosphorus runoff from this property. In addition, the District will perform a detailed analysis of phosphorus loading at the S-65 structure to determine how nearby watershed runoff or other possible sources of elevated phosphorus may factor into phosphorus loading calculations.

9. Integrating Research into Strategic Planning

All research should be clearly linked to the District's program annual work plans and strategic plan. At most, four of the eleven programs include research. The Kissimmee and Lake Okeechobee programs are predominantly funding construction and monitoring activities with the Kissimmee River Restoration and Lake Okeechobee Protection Plan projects, respectively. Each of these programs' annual work plans, however, should identify their research activities and describe how the results of that research help the District achieve its strategic goals and/or improve its operation of the Central and Southern Florida Project structures.

10. Northern and Southern Everglades Integration

The District recognizes the potential for confusion identified by the panel and will pay careful attention to maintaining a strong communication between programs, projects, and professionals in both areas. It should also be noted that the overall intention of the reorganization into the Northern and Southern Everglades is designed to promote integration of the many regional programs and projects, not to bifurcate the District.

11. Impacts of South Florida Development

The District finds this request difficult to implement as a specific examination of the region. Almost all the Districts programs are designed to deal with the effects of overall land development, whether for agricultural, residential, or other land uses. At the beginning of the 2009 SFER report development process, the production team with work with the authors to be more explicit about the potential impacts of development in the areas addressed within specific chapters, as appropriate.

RECOMMENDATIONS ON THE 2009 SFER

1. Existing Project Reporting

The production team will collaborate with the authors in an effort to improve the information provided in the initial paragraphs on any new projects, as appropriate. It should also be noted that certain project-related information, such as those related to the Comprehensive Everglades Restoration Plan, can be found in the Consolidated Project Report Database in Volume II, Appendix 1-3.

2. Report Cross-Referencing

The authors do not understand how to respond to this comment because detailed references are included at the end of most chapters and appendices, as appropriate. As with most scientific literature, the citations are designed to do what this recommendation suggests, that is to direct the reader to the appropriate chapter or document that discusses the aspect referenced further. If this comment is simply meant for the authors to include more detailed cross-referencing to other reports, then the SFER production team can work with the authors to add some additional clarifying references. The production team is concerned about requesting the authors to include more detailed cross-references and add further complexity to the reporting process.

3. New Project Descriptions

For new projects that would be expected to be reviewed on a technical basis, especially Chapters 3B, 6, 10, 11 and 12, the District agrees that a more detailed description should be provided for sufficient review by the panel. The SFER production team will work with the report authors to insure that additional information and reporting consistency is provided in future SFERs.

4. Documenting Report Authorship

Overall, the SFER production team agrees with the panel's continued concern on report authorship and contributorship, and will redouble its efforts to address this issue by defining more specific guidelines for identifying lead authors, other authors, and contributors in the individual chapters and appendices of future SFERs.

5. New Data Disclosure Policy

The District agrees and this panel comment is greatly appreciated.

THOUGHTS ON THE 2009 CROSS-CUTTING THEME: PERFORMANCE MEASURES

As previously noted above under specific recommendation #5, the District intends to develop an internal team of SFER authors to work collaboratively with our agency's strategic planning staff to compile and expand performance measures to be used in each SFER chapter for the 2009 Report. It is expected that a summary of these performance measures and the process used to develop them will form the basis of the integrative chapter (Chapter 1B) in the 2009 SFER – Volume I. The paragraphs provided with the panel's thoughts on performance measures contain many useful ideas and will help agency staff set priorities in the process of developing and applying performance measures.

RESPONSES TO COMMENTS ON CHAPTER 1A

Stacey Ollis and Garth Redfield

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Recommendation #1: *The use of explanatory picture, maps, and tables is a useful tool for this introductory chapter and can be expanded.*

Response #1: The panel's comments and recommendations on this year's introductory chapter are greatly appreciated. As suggested, additional supporting graphics will be included in the final 2008 and future reports, as appropriate.

Recommendation #2: *The peer review information can be moved to an appendix.(This recommendation was accepted during the peer review process).*

Response #2: Recommendation appreciated.

Recommendation #3: *The panel recommends that the special report section on public information, media and outreach activities be a regular part of the chapter. Such a section could cross-cut District education outreach activities from the headwaters of the Kissimmee to the coastal estuaries. Discussion of tangible progress should be included with examples of positive outcomes extending from the District's education outreach efforts. In addition, a section could be added to provide information of the positive effects of District activities extending well beyond Florida to help other states and nations. (This recommendation was accepted during the peer review process).*

Response #3: Recommendation appreciated.

RESPONSES TO COMMENTS ON CHAPTER 1B

Garth Redfield, Peter Rawlik, and Linda Lindstrom

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Recommendation #1: Add references on activities being done in cogs of the National Water Quality Monitoring Council's monitoring framework.

Response #1: The authors will add references and links to the section of Chapter 1B titled 'Frameworks for Reengineering' on products and projects being conducted in the four other cogs of the monitoring framework.

Recommendation #2: *'Sort out' specific information on water quality expectations.*

Response #2: The authors will add whatever additional specificity is possible on water quality information needs as a refinement of the general expectations.

Recommendation #3: *Chapter 1B and Appendix 2-1 provide insight.*

Response #3: The authors appreciate the support on the additional information provided on data collection and DBHYDRO in Chapter 1B and Appendix 2-1.

Recommendation #4: *Integrate reengineering information into Chapter 3 and elsewhere in the Report.*

Response #4: The authors will report on the progress on rationalizing or reengineering South Florida monitoring systems. We will continue to work with FDEP on Chapter 3 and with the authors of other chapters to make the data and information systems more transparent.

INTEGRATIVE

Recommendation #5: *Integration of sampling strategy and data analysis for compliance assessment is needed.*

Response #5: The SFER authors and staff responsible for reengineering the monitoring system will continue to work towards describing and integrating the 3 key cogs of the monitoring framework: 'develop monitoring objectives', 'design monitoring program' and 'assess and interpret data'. However, this coordination is a long-term effort and will span several iterations of the SFER.

RESPONSES TO COMMENTS ON CHAPTER 2

Wossenu Abtew and Chandra Pathak

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

The authors thank the panel for their review of the chapter and the comments provided. As stated in the panel report, the chapter format will continue to include three categories: (1) a hydrologic/management overview of South Florida and the District, (2) an annual water year update; and (3) emerging issues. The detailed hydrologic information serves additional purposes than the mandated reporting requirement. A lot of internal and external customers request for hydrologic data or analysis is satisfied by the contents of Chapter 2. This result in saving time that otherwise would be spent on compiling and analyzing hydrologic data for each request. A certain level of detail has such benefits. The format of the chapter will be maintained for coming water year's report.

Recommendation #1A: *The hydrologic system is clearly an immensely complex one, and the chapter is replete with facts about those factors that influence water sources, storage, flows, etc. The reader is provided a staggering amount of information and could be helped by the District staff doing the following:*

a. Emphasize more at a "20,000 ft" level the descriptions of the hydrologic system, how it operates, how it responds to spatial and temporal amounts of rainfall, how the system has been operated to accommodate the availability of water, and particularly the consequences of having too much, just the right amount, or too little water in terms of meeting management objectives. In response, the staff will add an appendix to the 2008 SFER Report containing such an overview and add a section in the 2009 SFER Draft Report incorporating this material for review next year.

Response #1A: For next year, we will provide a "20,000 ft" level description of the hydrologic system. For this year, we were to include an ASCE conference paper "Abtew, W., R.S. Huebner and C. Pathak. 2007. "Hydrology and Hydraulics of South Florida." K.C. Kabbes (ed.). Proceedings of the World Water and Environmental Resources Congress 2007. ASCE, May 15–19, 2007, Tampa, FL.". Paper is copy righted by ASCE. With the recommendation of the SFER editor, we have included the full reference of the paper.

Recommendation #1B: *Develop a set of "dashboard" metrics that describes how the hydrologic system has been operated and managed in the past water year and in a historical context so the reader has a quick grasp of the "state of the hydrologic system" in space and time. While these metrics could include the extent to which regulation schedules have been met and the circumstances under which they have or have not been met, they should include a sense of how well flood flows and water supply needs have also been met, e.g., how well have the Minimum Flows and Levels to WCA's and the estuaries been met. While as District staff note the system is monitored at any given time by comparing water surface elevations to regulation schedules, this is a formative (i.e., ongoing) evaluation as compared to a summative (i.e., at the end) evaluation suggested for the water year, and a table such as that contained in Figure 2-1 giving water year flows for not only the lakes and WCA's but also for water supply, estuarine system MFL's, and so forth is more what is envisioned for this dashboard. As noted by District staff, such as analysis is*

difficult because of the timing of SFER chapter preparation, and this evaluation of operations may have to look backwards a water year while the focus of the current SFER report focuses on the current water year - but such an analysis has significant benefits in an accountability context.

Response #1B: The original design of the Central and Southern Florida Project (C&SF) sought to balance multipurpose objectives that included flood control, water supply, navigation, recreation, and preservation of flora and fauna. To that end, the system is operated based on criteria defined in regulation schedules for the lakes and water conservation areas and optimal canal elevations for the system interconnecting those water bodies. At any time, a "dashboard" for the water managers and environmental scientists is the water surface elevation relative to those defined criteria.

Refer to Figures 2-24 – 2-30, 2-32, 2-34, 2-37- 2-39 for the lakes and water conservation area water levels through WY2007 relative to the specific regulation schedule. These figures provide the "state of the hydrologic system" temporally. Figures 2-23, 2-33, and 2-36 provide the spatial component by showing the interconnection of each area relative to one another.

Due to the deficit in rainfall, water levels in all but the case of WCA-2A (Figure 2-38) were below the regulation schedule. For WCA-2A water levels above the regulation schedule were utilized for water supply to the Everglades Agricultural Area located north of WCA-2A.

Because project purposes change over time and environmental systems are dynamic, data collected over years are utilized to revise regulation schedules and readjust optimum levels for canal operations.

While performance measures with respect to flood control and water shortages can be covered in Chapter 2, system specific detailed performance measures need to be covered in the respective chapters. The Ecology of the Everglades Protection Area, Lake Okeechobee, estuaries, Kissimmee River and Stormwater Treatment Areas performance measures can be well discussed in the respective chapters.

Recommendation #1C: *Link the discussion of the hydrologic system each year to the emerging topics raised over the past several years, i.e., the hydrologic monitoring system (as is done this year), droughts, hurricanes, long-term climatic change, long-term changes in water demands, and so forth. Clearly the impacts of the current drought were included this year and as the District staff have noted will be the subject of expanded analysis in the 2009 Draft SFER. A desirable part of that analysis will be the impact on the variability of the hydrologic system and particularly how water uses were met (or not met, as the case may be).*

Response #1C: The impact of the current drought will be expanded and presented in SFER 2009. The impact of the hydrologic variability on the water management system will be addressed.

Recommendation #2A: *A significant enhancement to this chapter would be to tie hydrology more strongly to water management goals and objectives. It is noted in a number of places that the two major purposes of water management at the District are flood control and water supply and that water supply releases are made for various beneficial uses that includes water supply for municipal and industrial use, agriculture irrigation, environmental restoration (especially the Everglades National Park), salinity control, estuarine management, and navigation. How water is managed to provide for these uses is described in great detail in this draft and in the hydrology chapter of the 2007 SFER. But what was not noted was how well the management objectives were achieved. While District staff in their response appropriately noted the complexity and variability of the system over space and time, the linkage to the dashboard indicators above, and even the changes in project objectives and how those affect system operation and management, they are encouraged to consider the following points in preparing the next SFER:*

a. How does the District measure success in managing flood control and water supply objectives – what are the metrics or indicators, what are the targets, and what are the assessment and evaluation methods? For example, salinity is used as an important indicator in estuaries, and water is released to maintain salinity levels in the estuaries at certain times of the year. Further, pulses of water are released to estuaries as well. How does the District determine it has been successful is maintaining desired conditions in estuaries, how does it measure that success? How well is the District able to respond to adaptive management if eventually salinity requirements are supplemented by nutrient loading and perhaps other requirements?

Response #2A: Success in managing for floods and for water supply is measurable, in part, by examining the water level hydrographs for the key canals of the system. egulation schedule and optimum stage ranges are established for the C&SF system. Departures from these ranges occur at times. he measure of success varies for each part of the system and in some cases, like wading bird nesting success, the results are almost immediate; however, not only tied to how well the system was operated but how rainfall and discharges occurred. Because project purposes change over time and environmental systems are dynamic, data collected over time are utilized to revise regulation schedules and readjust optimum levels for canal operations. or example, salinity ranges for the estuaries are established and measured in near real time. These data are used for planning studies and can indicate not only how the system is operated, but how development and runoff from local basins, those not regulated by structures, may be having an impact on the estuaries. There is a tremendous amount of natural variability that must be taken into account when developing performance measures and the "adaptive management" is an ongoing and developing science that more and more will need to be factored into operations.

***Recommendation #2B*:** *District staff note that risk management is a high priority for water managers and that the Operations and Maintenance Resource area is working to develop a risk management protocol which will be factored into decision trees and future operational criteria as it is developed. With the hydrologic system being so sensitive to spatial and temporal variations in rainfall and the ability to store and move water within the system and the economic, environmental, and social consequences of not meeting water needs being so high, it is encouraging to learn that risk management is being incorporated into system management. It is recommended that these protocols also include the variation in criteria for meeting objectives of the regulation schedules. For example, if a salinity requirement in an estuary is actually some particular level but the uncertainty in that level such that there is a significant error band about that level, how does that uncertainty translate back to the regulatory schedule and what degrees of freedom does that give managers in managing water?*

Response #2B: Risk management, like adaptive management, is a high priority to water managers. The Operations and Maintenance Resource area is working to develop a risk management protocol. As this is developed it will be factored into developing decisions trees and future operational criteria.

***Recommendation #3*:** *The appendices on stage-storage relationships of lakes and impoundments (Appendix 2-2) and regulation schedules (Appendix 2-6) from the 2007 SFER Report contained useful information which needs to be readily available to the readers of the 2008 SFER Report. Therefore, it is recommended that the 2008 SFER Report contain notes to their availability in the 2007 SFER report and/or include references to the appendices in the Literature Cited section of the report and provide hyperlinks to the appendices.*

Response #3: Based on the recommendations the following passage is added in the chapter and the corresponding references are included in the reference section.

On page 2-5, the following statement is added, "The surface area and storage in a lake or impoundment are functions of the water level. Stage-storage and stage-area relationships (curves) for the major lakes and impoundments are published in the 2007 SFER Report, Appendix 2-2 (Abtew et al 2007a)."

On page 2-6, the following statement is added, "Detailed regulation schedules for lakes and impoundments are published in the 2007 SFER Report, Appendix 2-6 (Abtew et al., 2007a)."

In the LITERATURE CITED section, the following two references will be added.

Abtew, W., C. Pathak, R.S. Huebner and V. Ciuca. 2007c. Appendix 2-2: *Stage-Storage Relationships of Lakes and Impoundments*. Redfield, G., ed. In: 2007 South Florida Environmental Report, South Florida Water Management District, West Palm Beach, FL. (www.sfwmd.gov/sfer).

Abtew, W., C. Pathak, R.S. Huebner and V. Ciuca. 2007d. Appendix 2-6: *Regulation Schedules*. Redfield, G., ed. In: 2007 South Florida Environmental Report, South Florida Water Management District, West Palm Beach, FL. (www.sfwmd.gov/sfer).

RESPONSES TO COMMENTS ON CHAPTERS 3A & 3C

Kenneth Weaver[1], Grover Payne[1]
and Shi Kui Xue

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment #1: *(Robert Ward) If the sampling was designed to support the protocol, there would be a minimum of 28 samples collected at each sampling site used in the excursion analysis. To overcome this data limitation, the authors of Chapter 3 developed an excursion analysis protocol that utilizes several assessment procedures, based on the number of samples available (or 'found' in DBHYDRO). Chapter 1B in this SFER, addresses this past concern and defines a context in which the water quality data limitations, as applied to excursion analysis protocols, can be discussed and addressed.*

To further elaborate, a minimum of 28 samples is needed to support the binominal hypothesis test chosen for use in the excursion analysis protocol. If there are not 28 samples available during the year, alternative data analysis methods are employed. The question arises as to why a data analysis method was chosen to conduct excursion analysis if the minimum number of samples required for its use will not be collected at all stations each year, by definition in the sampling protocol? As is pointed out in Chapter 1B, water quality samples are collected using a number of factors (e.g. water must be flowing) to determine sampling frequency. It is not clear if having a minimum of 28 samples at each site, per the scientific requirements of the excursion analysis protocol, is one of the factors guiding development of a new sampling strategy discussed in Chapter 1B.

Response #1: The primary focus of the current excursion analysis protocol is on regional evaluations with a minimum of 28 samples within a given analysis region (e.g., WCA-2 interior, WCA-3 inflows). The proposal in Chapter 1B is expected to provide the minimum required number of samples, except under extreme hydrologic years.

In addition to the regional analyses, Chapter 3A does present analyses of individual monitoring station excursions to provide additional information on sub-regional patterns. The existing monitoring protocol does not support analysis of individual site exceedances on annual basis, using the existing protocol, nor will the proposal in Chapter 1B. Individual site exceedances are therefore evaluated on a five year basis. It is unlikely that it would be economically or logistically feasible for the District to support a sampling regime requiring at least 28 samples per station per year without substantially reducing the spatial coverage. Requiring 28 samples at each site would necessitate sampling every 10-12 days, which would raise questions regarding the independence of samples, especially in the marsh. The authors believe that it is vital to maintain (or expand) the existing spatial coverage, given the substantial spatial heterogeneity across the EPA. The spatial variability across the EPA and within WCAs is greater than the annual or inter-annual variability at a site. We believe that an effective monitoring program must focus on the sources of variability

[1] Florida Department of Environmental Protection, Tallahassee, FL

in an attempt to minimize the overall variance in the resulting dataset. Further, we agree with the general thesis of the review comments; that is, any revised sampling protocol should support the analysis methodology and visa versa.

Comment #2: *Are the water quality standards, whose compliance is being evaluated in Chapter 3, applicable to only flowing water or any water in the water column at any time of sampling, whether flowing or not? Or is the sampling strategy, described in Chapter 1B, relevant to only the permit requirements associated with the pumping?*

Response #2: Florida's water quality standards apply to all waters of the state. The standards are applicable whether the water is flowing or not and throughout the water column.

The sampling strategy described in Chapter 1B is relevant to both ambient monitoring [e.g. Chapter 3, 303(d) listing] and permitting requirements. However, the proposed conditional monitoring based on flow conditions would apply only to monitoring at structures where the primary objective is generally to characterize the water quality and loads flowing through the structure and the characterization of stagnant water behind the structure is not of great value. Additionally, to assure that the revised monitoring continues to satisfy permit objectives, any changes to permit required monitoring will require the approval of the permitting agency (typically DEP) and formal modification of the permit.

Comment #3: *Can the sampling strategy, described in Chapter 1B, be connected to the excursion analysis protocol, described in Chapter 3A, to insure the minimum numbers of samples are available to support evaluation of standard compliance? If it is not possible to insure the minimum number of samples will be collected each year at each sampling site (e.g. due to economic constraints), is it possible to revisit the excursion analysis protocol to better match available samples with chosen methods to evaluate standard compliance? Currently, there are several excursion data analysis methods employed in order to handle a range of sample sizes available at the sampling sites.*

Response #3: The sampling strategy, described in Chapter 1B, can and should be connected to an excursion analysis protocol to insure that the monitoring program supports one of its major objectives; that is, determine the quality of waters in the region. It is possible to insure that the revised monitoring plan will provide the minimum number of samples to support the excursion protocol. Although it is possible to revisit the excursion analysis protocol the authors believe this will be neither necessary nor advisable. The monitoring network described in Chapter 1B would provide sufficient data to support the excursion analysis protocol, with the exception of annual DO at the flow structures (inflows and outflows) since the population of stations is less than 28. There is also a potential for insufficient sample sizes during extremely dry years. Furthermore, the protocol was developed to be consistent with states 303(d) listing protocol. The authors advise that this be maintained into to insure a maximum level of consistency between evaluations.

The current excursion analysis is being conducted on a regional basis and the minimal sample size is applied to a group of stations within a given region. There is no requirement for 28 samples at a single station. However, the samples collected within a region need to be reasonably evenly distributed both spatially and temporally in order to prevent biased results/conclusions.

Comment #4: *Can there be a reminder in the text of the sampling strategy for pesticides. Use of the term 'pesticide monitoring events' suggests that there is a separate sampling strategy used for pesticides. Are the pesticide data stored in DBHYDRO?*

Response #4: Pesticide monitoring is conducted on a quarterly basis as a separate program from the other monitoring. The pesticide data are stored in DBHYDRO. The requested additional text was added to the final report.

Comment #5: *In the specific conductance discussion on page 3A-21, lines 403-404, it is noted that all but one of the WY 2007 exceedences occurred during periods of no recorded flow. Will the new sampling strategy, described in Chapter 1B miss many of these exceedences in the future since only flowing water will be sampled? Consistency of excursion analysis results, across any sampling strategy change, is of concern. Sampling strategy changes have many ramifications, which if understood, often can be accommodated in a scientifically sound manner (e.g. using both sampling strategies for a year to provide correlation among the old and new strategies)..*

Response #5: The specific conductance exceedances discussed in lines 403-404 referenced conditions within the interior marsh. Under the sampling strategy described in Chapter 1B these samples would still have been collected. The flowing water requirements would only apply to inflow and outflow structures. This proposed flowing water requirement is still being considered by the larger interagency working group. While the biweekly when flow is recorded recommendation would provide a representative picture of EPA inflows and outflows, it remains to be determined whether this should be the only objective of the structure monitoring. Several non-SFWMD team members have expressed an interest in the continued monitoring during non-flowing periods at selected structures to provide a characterization of boundary or canal conditions.

The authors agree that the network optimization effort needs to consider consistency of results among time periods.

Comment #6: *On page 3A-33, it is noted that the non-ECP permit was amended on July 13, 2006. This legally driven change to the monitoring program (or more broadly, water quality information system) has implications to the consistency of information provided over both time and space. Can protocols be established to incorporate such modifications into the monitoring program in a well documented and transparent manner?This would help all those who use DBHYDRO data understand the changes taking place in the sampling regime employed.*

Response #6: The changes to the non-ECP Permit were approved by DEP as a modification to the permit. DEP technical staff, including the authors of Chapter 3, were consulted prior to approval of the modification. Modifications to DEP issued permits are conducted in a public process, which include public noticing requirements. Furthermore, the SFER provides additional documentation and transparency.

Comment #7: *On page 3A-30, lines 546-548, the following quote is noted: "To document the accuracy of the collected data ….the District has compared WY 2007 water quality data from non-ECP structures to state water quality standards." How does comparing data to standards insure its accuracy? The QA/QC procedures, followed in the collection of the data, insure its accuracy for use in standard compliance work.*

Response #7: Agreed, comparison of water quality data to standards does not insure the accuracy of the data. Proper QA/QC, collection, and analysis procedures provide confidence in the data's accuracy. The text was revised in the final chapter.

Comment #8: *As the new Everglades Protection Area Phosphorus Criterion Achievement Assessment comes online, compliance methods are well defined in the criterion itself. There is a separately designed network to supply the data; however it is not clear if the data needs for the*

assessment influence the sampling strategy at the 58 stations in the network (or if the project requirements, alone, associated with the various stations, guide the sampling strategy). The fact that only 30 stations of the 58 had sufficient data to support the compliance protocol in the TP criterion (page 3C-4, line 124), suggests that the sampling strategies employed at the 58 stations do not account for the data needs of the TP criterion. Or are there reasons, such as dry conditions, that greatly limited sampling in WY 2007?

Response #8: A monitoring network consisting of 58 stations was established specifically to be used in the evaluation of compliance with the TP criterion. The monitoring network was established in accordance with the requirements of the phosphorus criterion rule. Existing sites that were being monitored for other purposes were incorporated into the network where ever possible to maintain the period of record. However, to obtain the required spatial coverage, several new monitoring stations were added to the existing sites to complete the 58 station network. The minimum sampling frequency for all marsh sampling stations is monthly which would normally provide 12 samples annually (i.e., twice the minimum of 6 samples per site required for the data to be included in the assessment).

As stated in the chapter, there were two reasons for a large number of sites not having the minimum of 6 samples required for inclusion in the TP criterion assessment. First, monitoring at the full network was not initiated until January 2007. Since the water year ended April 30, 2007, none of the new (i.e., previously non-existing) sites had sufficient samples collected during the monthly monitoring. In addition, during the January–April 2007 monitoring period it was impossible for the new sites to satisfy the requirement for samples to be collected in both the wet (May–September) and Dry (October–April) seasons for the data to be included in the assessment.

In addition, during the second half of water year 2007, dry conditions resulting from an extended drought precluded sample collection at a number of sites for several months. Since monthly sampling at the entire network has been initiated and will continue in the future, the current sampling strategy is expected to provide an ample number of samples at all sites for future TP criterion achievement assessments unless extremely dry conditions or other unforeseen circumstances prevent sample collection for extended periods.

Comment #9: *The definition of compliance contained in the TP criterion (Chapter 3C) is rather specific and, due to critical ecosystem health issues, does not integrate well with the 'excursion analysis protocol' employed for the other water quality constituents assessed in Chapter 3A (thus the need to break the compliance assessments in Chapter 3 into parts A and C). At what point does the monitoring and compliance assessment of TP move from warranting a special section of Chapter 3 into the routine standard assessment compliance descriptions presented in Chapter 3A, even if different excursion analysis methods are employed? This question is asked in the context of providing more integration of water quality assessments across South Florida and across water quality constituents—to better connect with development of a more integrated water quality monitoring design for South Florida, as well as a more integrated view of water quality in South Florida that can be presented in future SFER reports. Chapter 1B in the 2007 SFER hinted at how this might be accomplished.*

Response #9: In many ways combining the two chapters makes sense but, several factors make the two chapters unique, especially when expanding the scope of the chapters outside the Everglades Protection Area (EPA). First, Chapter 3A evaluates compliance of monitoring results with Class III surface water criteria that are applicable throughout the state so it would be relatively straight forward to expand the assessment to other areas across South Florida. In contrast, the numeric phosphorus criterion is only applicable within the EPA. In addition to establishing the numeric phosphorus criterion, the phosphorus criterion rule also provides a long-term four-part compliance assessment methodology that is unique to phosphorus. Outside

the EPA, phosphorus as well as nitrogen are regulated by a narrative criterion designed to prevent imbalances in the natural biological communities. Assessing compliance with the narrative criteria is much more complex and requires large amount of biological data that is generally unavailable outside the EPA. Efforts are currently underway to establish numeric nutrient criteria for all Florida waters.

Due to the ecological significance of nutrients (especially phosphorus) within the EPA and the extensive restoration efforts underway, one of the goals for Chapter 3C is to track the long-term effects of changes in water management, restoration efforts, and climatic conditions on the nutrient levels entering and existing within each portion of the EPA which cannot be done with a more cursory evaluation. Therefore, Chapter 3C provides a more extensive assessment of nutrient loads and concentrations entering and occurring within each portion of the EPA compared to the more routine assessment of criterion compliance performed for other water quality parameters in Chapter 3A.

RESPONSES TO COMMENTS ON CHAPTER 3B

Donald M. Axelrad[2]

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS (TECHNICAL)

Recommendation #1: *A mass balance model for sulfur and mercury should be developed both for large areas (such as some of the STAs) and for hotspots of methylmercury accumulation.*

Response #1: FDEP and the SFWMD are planning further research efforts on Everglades mercury and sulfur, and a sulfur mass balance is a high priority. There are existing data on mercury sources (atmospheric and surface water borne) to the Everglades and e.g. for STAs; elsewhere, for example mercury hotspots, sediment mercury levels may provide estimates of relative rate of mercury loading. The availability and quality of data on mercury loading to STAs and hotspots need to be examined.

Recommendation #2: *A detailed research project to examine levels of mercury and sulfur (all forms) in water, sediment and biota should be undertaken that has a sufficiently robust sampling plan (temporally and spatially, such as once a week) that will provide sufficient data to generate hypotheses about the interactions among compartments. Data on all compartments must be taken at the same time to allow correlation.*

Response #2: FDEP accepts the validity of this approach. There are currently no plans to conduct this research, it would be a costly undertaking, but this will be discussed at the February 2008 Everglades sulfur workshop which FDEP is in the process of organizing. Reexamination of USEPA R-EMAP data may be a worthwhile exercise as well to investigate sulfur and mercury relationships.

Recommendation #3: *More frequent sampling of mercury levels (and sulfur in its various forms) in sediment, water, and fish tissue (mosquitofish and bass), as well as water levels, should be undertaken in hotspots and non-hotspots of methylmercury. Sampling must be at the same time, and weekly.*

Response #3: As for the previous recommendation, FDEP accepts the validity of this approach, and it will be discussed at the February 2008 sulfur workshop.

Recommendation #4: *Bioindicators of methylmercury should include both short-lived fish (such as mosquito fish) that indicate local exposure, and longer-lived fish (bass) that integrate over time and space. Further, bass are considerable interest because of human exposure.*

Response #4: Recommendation accepted. There is a need for better communication between the groups collecting fish mercury-data (FDEP, FFWCC, and SFWMD). The Everglades mercury in sunfish and bluegill sampling effort, presently conducted predominantly by the SFWMD, needs discussion as well because these fish make up a large part of the diets of Everglades wading birds.

[2] Florida Department of Environmental Protection, Tallahassee, FL

Recommendation #5: *The relative contribution of small urban sources of mercury to the Everglades needs further study to ascertain both its importance and the potential for reducing mercury loads.*

Response #5: The statewide mercury TMDL, now late in the planning stages, will address this matter of the importance of small urban sources of mercury to the Everglades.

Recommendation #6: *Determine the levels of sulfate that amplify methylation (e.g. especially maximum levels, and the level that inhibits methylation).*

Response #6: The levels of sulfate that amplify or inhibit mercury methylation will be a major discussion point at the February 2008 sulfur workshop, and research needs - if any - will be identified.

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment #1: *Mercury and sulfur dynamics within the Everglades is an issue that cross-cuts several different chapters, including strategies for reengineering water quality monitoring (1B), status of water quality (3A), Ecology of the Everglades (6), Everglades research plan (6-1), and invasive exotic species (9), since in the later case, species are differentially affected by mercury. Mercury and sulfur issues should be integrated among the chapters, and within chapter 3B. Further, the mercury chapter should provide an overview of how the data they are collecting, and the mercury cycling information that they are accumulating, relate to overall restoration and management within the Everglades, as well as to specific regulations and acts or laws.*

Response #1: The authors of the several chapters need to discuss integrating mercury and sulfur issues among the chapters. Chapter 3B will, beginning next year, discuss overall restoration and management of the Everglades in the context of mercury and sulfur, as well as identify relevant and specific regulations, acts or laws relevant to mercury and sulfur.

RESPONSES TO COMMENTS ON CHAPTER 4

Stuart Van Horn with Chapter Co-Authors

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment #1: *While the BMP "equivalents" provide an innovative basis for BMP implementation, the panel recommends that the "equivalents" assigned to each BMP be reviewed periodically in light of additional experience gained with and effectiveness found for each BMP." An explanation, analysis, and evaluation of this system was requested by the Panel and provided by District staff at the 2008 SFER public hearing.*

Response #1: Similar to what was presented at the SFER workshop for Chapter 4 , a discussion of the BMP "equivalents and relatedness to BMP plans was added to Appendix 4-2, along with observations made regarding EAA BMP plans and farm level phosphorus data for WY2007. The information can be found on pages 4-2-14 through 4-2-22, Appendix 4-2. A reference to this information in Appendix 4-2 was also added to Chapter 4 at lines 282-285.

Comment #2: *The Panel strongly supports the District's activities in the C-139 basin regarding the research, development, and implementation of BMPs to control phosphorus and the rule development taking place to enhance the District's ability to support its regulatory activities in this area.*

Response #2: Any additional efforts regarding BMP optimization and demonstration projects, and regulatory rule revisions regarding the BMP program, accomplished during WY2008, will be reported in the 2009 SFER.

Comment #3: *It was recommended in the Panel's 2007 SFER report that "Continued "tightening" of the chapter is recommended using summary tables where possible…and references to background information in other documents that are readily available on the District's website or some other location." While no recommendation was made regarding the chapter outline because the outline appeared to be well structured, the chapter could still be "tightened" as recommended previously to reflect further the Accountability nature of its purpose.*

Response #3: Agreed. The chapter authors will evaluate how best to accomplish further improvements in Accountability and implement identified improvements with the 2009 SFER.

RESPONSES TO COMMENTS ON CHAPTER 5

Kathy Pietro with Chapter Co-Authors

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Comment #1*: A summary table directly comparing performance to permit requirements for all permitted parameters (regardless of specific law or code) on a parameter by parameter basis should be included in an opening section of this chapter to better assess how well the STA's are working from a regulatory perspective. If an important parameter does not have regulatory criterion perhaps a target value could be used in the comparison.*

Response #1: The compliance status of the STAs is found in the beginning of the chapter (second bullet listed under the "WY2007 STA Highlights" section) and tables showing the maximum contaminant limits for permit required parameters, as well as the other water quality parameters measured at the STAs are found in each individual STA section. The chapter presents the parameters required by the EFA permits. These were based on Class III criteria and are the levels required under NPDES. The chapter presents the parameters required by the EFA permits (e.g. Table 5-7). The District does not have target limits for parameters that are not required under either of these permits. Many of these parameters are monitored for optimization purposes, to help better understand biogeochemical processes as they relate to STA performance. For Phosphorus, the addition of a table showing the permit compliance numbers as stipulated in the recently issued TBEL permits is under consideration.

Comment #2: We strongly support the new directions to be taken in *2008 to better assess a) why some STA's appear to have steady or improving performance with time while other do not; and b) the performance of different cells with different vegetation communities within a specific STA.*

Response #2: Recent focus has been on STA-1W; for FY08, the focus of optimization activities will be on STA-5. The STA Management Division is currently developing an updated research plan taking into account STA performance and observations thus far, which will address all keys phases of STAs, including start-up, recovery, optimization, and sustainability. Also, funding has been budgeted in FY08 for more comprehensive analysis of water quality, vegetation, soil, and performance data for all 6 STAs. The overall goal of our applied research is to provide short-term guidance in operational decision making, which leads to our long-term goal of sustainable and optimized STAs that achieve water quality goals with a minimum of rehabilitation activity.

Comment #3: *The panel believes that one of the STAs or perhaps a specific cell would be an excellent location to perform a detailed mass balance for sulfur to better determine its effect on mercury methylation, phosphorus release, and plant toxicity. These results might shed light on recommendation 2 above.*

Response #3: The District will be investigating the relationship of sulfur on mercury methylation in FY08, but the actual testing platforms that will be used for this evaluation are still under consideration at this time. This suggestion is currently being coordinated under the District's sulfur research initiative. For more information refer to final review panel comments prepared by Mark Gabriel (SFER Chapter 3B, Appendix 3B-2 Response to Comments). Details are listed under "Small-Scale Sulfur Mass Balance Study" section.

RESPONSES TO COMMENTS ON CHAPTER 6

Fred Sklar with Chapter Co-Authors

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment #1: *This chapter provides a wealth of information about ecological research in the Everglades, based upon an impressive amount of work covering an array of subject areas. In general, it continues to provide excellent context for Everglades restoration activities. The chapter covers hydrological patterns (1 project) and four main ecological areas: wildlife (4 projects), plants (3 projects), the ecosystem (3 projects), and the landscape (5 projects). The aim was to select projects of focus (17 in total) based on short-term operational needs and long-term restoration goals. The projects generally were presented so that overall goals were clearly linked to the descriptions. In the Summary, Table 6-1 is valuable in providing an excellent overview framework.*

The chapter authors provided excellent, detailed responses to the panel's many comments, questions and suggestions. Their responses were thoughtfully conceived, meticulous, and soundly based. The authors indicated that most of the information in their responses would be added to the chapter. Once that is done, Chapter 6 will be outstanding in both integrative and technical quality. This evaluation provides an overview of the chapter. It also focuses on points that remain to be considered, and/or additional information in the authors' responses that was not indicated for inclusion in the chapter.

Response #1: Unless noted otherwise, all the questions and concerns outlined below by the Review Panel are addressed in Appendix 1A-5 (Replies to Reviewers) and have resulted in modifications to the chapters of concern.

INTEGRATIVE REVIEW

Comment #2: *From an overall integrative standpoint, the draft version of Chapter 6 unfortunately contained little cross-referencing to other Chapters, and little by way of integrative data summaries and analyses bridging projects within the original draft of Chapter 6.*

Response #2: Authors of Chapter 6 agree that District-level integration is needed. Current efforts focus on integration within the Greater Everglades and mechanisms for this integration still need to be developed.

Comment #3: *Within each section of the draft version, though, strong integration generally was indicated. The Hydrological set-up section was excellent in integrating the various project areas. The Plant Ecology section was strongly integrated, as was the Wildlife Ecology section except for the fourth project, development of a qualitative macroinvertebrate index for ecosystem conditions. While the potential for integration of this index is high, some serious technical problems in the design call into question the overall utility of this index (below).*

In the Ecosystem Ecology section, the Reflux Study is especially well integrated. The Fire Project mentions that many sub-studies have been initiated to assess ecosystem processes affected by fire

(water quality, soil and vegetation nutrient biogeochemistry, plant biomass production and storage, plant species dynamics, ecosystem modeling). The chapter authors indicated that explanation would be included as to how these sub-studies are being integrated into the overall goal of identifying ecotypes of special concern and focusing on their biogeochemical linkages. It should also be mentioned that such integration is well explained in Appendix 6-1.

In the CHIP, improved integration would be helpful in the "Higher Trophic Level Responses" sub-section; for example, the section focused its description on wading birds and mentioned (as personal communication) that prey densities in WCA-2 were relatively low in WY2007, without cross-referencing to the excellent information presented about prey densities in the Wildlife Ecology section. Another sub-section of the CHIP, "Microbial Change", presented few replicated data on microbiota and seemed a very preliminary description. The Ecosystem Ecology section also includes a description of a preliminary study to apply signature pigments methodology to assess periphyton composition and then to use this information to assess ecosystem condition. Considering the explanation provided by the District about the underlying methodology (to be added to the chapter), there is high potential utility of periphyton signature pigments as an integrative tool across Everglades ecosystems.

Response #3: The macroinvertebrate index and the pigment signature techniques have been edited to address panel concerns. The complexity of the Fire and CHIP projects are captured in separate documentation. The SFER provides only a cursory overview of these projects.

TECHNICAL REVIEW

Comment #4: *Chapter 6 was designed to provide only basic contextual technical background about projects that have been described in detail within earlier SFER's. Nevertheless, sufficient information for context was inconsistent and lacking in most sections (hypotheses, experimental design, rationale, duration, metrics, and expectations). In addition, appropriately detailed descriptions were lacking about new projects, especially the macroinvertebrate index and the application of signature algal pigments in using periphyton to assess ecosystem condition (mentioned above).*

Response #4: Reference to previous SFER chapters will supply context for ongoing studies. New studies have been enhanced with detailed descriptions.

Comment #5: *In response to panel comments, the chapter authors clarified many points but did not indicate whether some of this information would be included in the revised chapter (e.g. the relationship between wading bird foraging/ nesting behavior and hydrology; the rationale for potentially extending the study for more than three years to adequately characterize the differing hydrological/prey cycles; the additional data needed to understand the experiment described from lines 453-; the relationship between fine root turnover and active growth; effects of differential aeration at the heads and tails of tree islands; the relationship between inflow and porewater inputs of phosphorus, etc.).*

Response #5: Most of the information supplied to the panel in our replies has been inserted into Chapter 6.

Comment #6: *Hydrologic Patterns—This excellent section includes a helpful comparison of WY2006 and 2007.*

Wildlife Ecology—The focus of four described projects continues to be on interactions between wading birds, aquatic prey species, and hydrology, with the short-term goal of preventing further environmental degradation and the long-term goal of restoring historical wildlife populations.

Wading bird nesting patterns—WY2007 was a poor year for wading bird nesting, with a 36% decline in nests compared to WY2006. Continued focus on wading birds (especially great egret, snowy egret, tricolor heron, white ibis, and wood stork) as indicators of wetland ecosystem health, and the four parameters used to assess recovery of pre-drainage wading bird nesting patterns are highly merited. The loss of the major (Alley North) rookery in WCA-3 was clearly described; estuarine rookeries were also minimal in WY2007, and nests in the ENP dramatically declined, attributed to two large reversal events in March–early April.

Food limitation on wading bird reproductive success—(3-year study, to include comparison of years with different hydrologic conditions) – The overall hypothesis tested in this experiment is that white ibis nesting success is limited by food supply. Provisional analyses indicated that extra food significantly increased nestling mass growth and survival of "B" chicks (2^{nd} chick born), supporting the hypothesis that white ibis nesting success is limited by food supply. Age of mortality and mean age of dispersal were not affected by treatment or hatching order.

Prey availability and foraging success of wading birds—Prey availability was identified is the major factor limiting reproductive success in wading birds, yet factors affecting prey availability are poorly known. The objectives of these experiments were to assess effects of submersed aquatic vegetation (SAV, year 1) and emergent vegetation (year 2) x water depth on prey availability for wading birds. The authors focused on foraging site selection and foraging success rather than attempting to measure prey availability directly. Prey were hypothesized to be more available in shallow water with lower SAV densities.

Macroinvertebrates for rapid assessment of environmental conditions in subtropical wetlands—Although the premise of this study—that macroinvertebrates can be valuable indicators of ecosystem conditions—is well founded, the approach used in developing the qualitative macroinvertebrate index (only field-identifiable fauna, only presence/absence) seems too superficial and limited to be fruitful. The "Methods" section, needed to evaluate the efficacy of this index, was seriously lacking. Although additional information is to be provided in the revised chapter, the authors continued to maintain that the selected Rapid Assessment Procedure will allow minimal personnel given 30-60 minutes to collect and process data, and make an immediate general statement regarding ecosystem condition. Thus far, however, no replicates have been taken, preventing evaluation of the efficacy of this qualitative index. The authors stated their intent to incorporate additional samples as replicates, but replicates need to be taken at the same time (date). They also mentioned several approaches to assess system impairment, but did not clarify their rationale for designating impaired versus reference marshes.

Response #6: These concerns have been addressed.

Comment #7: *Plant Ecology—In three projects in WY2007, there was continued focus on hydrology toward understanding the dynamics and dominance of dominant plant species and algal assemblages.*

Ridge and slough transplant experiments—A new slough competition study was initiated at the Loxahatchee Impoundment Landscape Assessment Facility. The historical perspective is instructive—that the central portion of the Everglades historically was a flow-way with a corrugated ridge-and-slough landscape; and that loss of spatial patterning has been attributed to reduced flow, but the experimental basis to predict whether increased flow will restore the natural vegetation is lacking. These valuable experiments will examine how flow rate and depth

interact with plant structure to build ridge and slough habitats. The hypothesis and the experimental design are clearly conveyed, including the helpful diagram in Figure 6-14.

Tree seedling stress evaluation, based on a complex, ongoing greenhouse experiment—This well-written section targets the slough, ridge and tree island mosaic complex. The goal of this study is to determine changes in structural and functional integrity of the Everglades from management practices, and the extent to which the natural integrity can be restored. Specifically, the experiment is designed to examine the influence of the frequency and intensity of hydrologic extremes on recruitment of tree seedlings on tree islands, including species responses to (1) constant hydrology (drought, optimal, flooded)—tested in WY2007; (2) fluctuating hydrology (sequential order of drought and flood); and (3) the potential mitigating influence of an interspersed period of average (non-extreme) conditions. The three species selected for study represent a range of flood tolerance.

Tree island root evaluation—The authors made a strong case for the premise that the dynamics of fine root production, mortality and decomposition across nutrient and hydrological gradients and hydroperiods may strongly influence restoration success. They assessed fine root dynamics in previously established plots on three tree islands including a tropical hammock with short hydroperiods, a cocoplum-dominated tree island with moderate hydroperiods (< 6 months inundated), and a willow tree island with artificial flooding (< 6 months inundated). The data indicate that fine root production was highest at the head of tree islands with contrasting short/intermediate hydroperiods and high TP (low TN:TP ratios). In contrast, root biomass was higher near the tail of these tree islands, and highest in the flooded tree island. Turnover of fine roots was higher in the low-water-depth, P-rich soils of the near-tail areas, suggesting that fine roots decompose more slowly in these less-than-optimal conditions. The authors suggested that soil formation on tree islands primarily occurs through organic matter decomposition and slow turnover of fine roots, although supporting information about litterfall and soil formation was not included.

***Response #7:** Reference to previous reports on litterfall will be incorporated into a more comprehensive synthesis of soil formation in the next SFER.*

***Comment #8:** Ecosystem Ecology—The overall goal of the three projects included in this section is to identify ecotypes of special concern and focus on biogeochemical linkages therein.*

Rapid assessment of periphyton diagnostic pigments (chemotaxonomy)—The authors described a preliminary study of assessment of algal composition via diagnostic pigments, and, from there, development of a classification regression tree analysis of algal groupings (based on the pigment signatures) to estimate water quality parameters (TP, TKN, DO, pH, temperature, specific conductance, DO). This section, describing new effort, suffered from almost complete lack of information about the methods and approaches used; this problem will be rectified in the revised chapter.

Evaluation of phosphorus flux (Reflux Study)—The authors described ongoing work in a 4-year project (through 2008) in the northern cattail region of WCA-2A. The project is related to the long-term goal of improving wetland regions impacted by excess P. The objectives are to (1) quantify in situ sediment P fluxes to the water column; (2) use field enclosures to evaluate management practices (herbicides, burns) to immobilize P in the sediments; and (3) to apply a dynamic model to simulate sediment P flux under different conditions.

A. Phosphorus export (objective 1)—an experiment was conducted to compare P export by 3 control enclosures vs. 3 enclosures to which "SAV-treated" water lower in total phosphorus (TP) was added. The data indicated that the SAV-treated units were exporting

P. Additional measurements indicated that porewater was rich in soluble reactive phosphate (SRP), with low but significant P flux from the sediment to the overlying water column.

B. Management practices vs. sediment P flux (objective 2)—An enclosure experiment was used to evaluate effects of management practices as herbicide and herbicide + submersed macrophytes on sediment P flux. The data indicate that porewater is an important source of P to the water column in cattail-dominated areas, and that recovery of these areas will not be likely until both inflow P and porewater P are reduced. The authors logically call for more research to assess the rates and mechanisms controlling P flux from porewater to the overlying water.

The Fire Project (Accelerated Recovery of impacted areas)—The rationale for this important project is to assess whether repeated prescribed fire is effective in accelerating ecosystem recovery of cattail (and willow)-dominated, P-enriched areas by favoring re-establishment of sawgrass and other native species (found in Appendix 6-1-20; should be added to the chapter). The project is designed to document natural versus accelerated recovery at the landscape level (found in Appendix 6-1-20; should be added to the chapter). The objectives are to use repeated prescribed fires to encourage a long-term species shift from cattail back to sawgrass, and to accelerate burial of P-enriched peat below the active root zone. The large-scale experiment follows a before-after-control-impact-paired series design and includes 6 plots (each 300 m x 300 m) with upstream, within-plot and downstream sampling stations. There are 2 unenriched controls; 2 highly (P) enriched sites dominated by cattail; and 2 moderately enriched sites with a cattail/sawgrass mix. Treated plots are being burned periodically (wildfire affected 1 moderately enriched plot in Feb. 2006, as the first fire in the Fire Project; prescribed fire was applied to 1 highly enriched plot in July 2006). Detrital biomass, P release, periphyton and cattail responses are being tracked.

Cattail Habitat Improvement Project (CHIP)—The goal of the CHIP is to provide a preliminary assessment of the role of active management in accelerating improvement of cattail habitat (found in App. 6-1-19 – should be identified in the chapter). The overall goal of the in situ large-scale experimental study in the CHIP is to assess how well cattail areas can be restored, considering two major objectives: (1) assess whether created openings (via fire and herbicides) will lead to increased wildlife diversity and abundance, and (2) compare the ecosystem functions of these open areas versus natural sloughs (same hypotheses for both, found in App.6-1-18 – should be contained in the chapter). The experimental treatments are applied with the aim of maintaining plots at 10% or less cattail cover; the first comprehensive sampling was completed in Jan.–Feb. 2007. Thus far, herbicide (as glyphosate or glyphosate + imazapyr) was applied in May 2006, August 2006, and March 2007, and a prescribed burn was applied in July 2006. Overall, the results from the first 6 months of data collection support the hypothesis that openings are ecologically better (higher nutrient fluxes, more nutritional plants, more foraging by wading birds).

A. Water and floc nutrient chemistry—The surface water quality of open and control sites was compared up to ~3.5 weeks post-burn. In the overlying water, the P species were described as significantly higher in open versus control sites. Floc data were also collected, apparently at 6 months post-burn: floc of open plots had significantly higher TP but lower SRP, lower total carbon (TC) and total organic carbon (TOC) than control plots, with no change in TN or ash pre- vs. post-burn.

B. Microbial change—As stated in App. 6-1-29, an understanding of changes in the structure and functions of microbial communities in peat accumulation and nutrient turnover will be essential for successful restoration of the Everglades. Thus far, few replicated data for microbiota are available in this description of preliminary information.

C. Higher trophic level responses—Low water levels in Jan. 2007 prevented sampling of invertebrates and fish. Wading bird abundance (11 species) was significantly higher in open plots than in control or unenriched plots. An attempt was also made to assess cryptic birds (5 species) based on visual sitings; highest numbers were observed in enriched and transitional control plots.

Landscape Ecology—This section provides generally excellent, essential information about long-term changes in large-scale structure and function.

CERP vegetation mapping—The vegetation mapping products, developed from 1,400 aerial photographs (2004-), should provide a valuable baseline for RECOVER.

Book on the pre-drainage Everglades—This should be an exciting, excellent contribution. The forensic approach is excellent.

Soil profiles of macrofossils—This important work takes an innovative approach, initially targeted for Shark Slough, in using macrofossils (especially sawgrass and other macrophyte seeds; also fossil pollen, spores, exoskeletons, shells, etc.) with appropriate dating techniques, as well as certain biomarker proxies to reconstruct historical vegetation on a smaller scale (10s of meters) and characterize boundary movements between ridge and slough communities.

Response #8: These are excellent summations of the various research programs sponsored by the SFWMD.

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Recommendation #1: *Chapter 6 should be more strongly cross-referenced to other chapters, and within the chapter, the four major ecological areas of focus should be more strongly integrated. Accordingly, the chapter Summary should be revised to include additional overview of the objectives and hypotheses, project duration, agencies involved, integration of the major projects, and brief description of planned future directions.*

Response #1: Cross-referencing is done when-ever possible. The Summary has been edited to reflect within-chapter integration. Objectives, hypotheses, and collaborations are highlighted in the Strategic Plan (Appendix 6-1).

Recommendation #2: *New projects (e.g. the macroinvertebrate index and application of periphyton signature pigments) should be described in detail to enable evaluation of technical merit. Sufficient information about ongoing or recently completed projects and experiments, needed for context, should also be presented consistently within each major ecological area of focus.*

Response #2: New studies have been enhanced with detailed descriptions.

Recommendation #3: *Altered design of the macroinvertebrate index is encouraged and should include replication and rigorous statistics, and to consider more than field-identifiable organisms and more than simply presence/absence.*

Response #3: Agreed.

Recommendation #4: *Additional research planned by the District to assess the rates and mechanisms controlling P flux from porewater to the overlying water column will yield valuable insights about P dynamics in the Everglades.*

Response #4: Agreed.

Recommendation #5: *In the tree islands root evaluation study, supporting information should be included about litterfall and soil formation.*

Response #5: We agree, reference to previous reports on litterfall will be incorporated into a more comprehensive synthesis of soil formation in the next SFER.

RESPONSES TO COMMENTS ON CHAPTER 7A

Beth Williams and Larry Gerry

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Recommendation #1: *The panel endorses the concept of Project Implementation Reports and recommends that the experiences gained be used to develop a "lessons-learned" or a type of BMP list for better understanding the interactions of projects for the medium and long term as related to the CERP.*

Response #1: We will explore additional alternatives for capturing lessons-learned for the medium and long term project implementation. One method currently used is the preparation of CERP Guidance Memoranda (CGMs) that can be found on the EvergladesPlan.Org site. CGMs provide policy and technical guidance to project teams based, in part, on lessons-learned.

Recommendation #2: *The relationships between what is proposed in chapter 1B and this chapter should be clarified in future reports.*

Response #2: We will clarify the relationships in future reports.

Recommendation #3: *The District should continue to reinforce the logic of the adaptive management concept in the implementation of CERP activities and in is public education and outreach efforts.*

Response #3: The District will continue to develop its adaptive management program to address project and program uncertainties and to learn through incremental adaptive restoration.

Recommendation #4: *The panel supports the idea of adding a short section summarizing the relationship between implemented CERP projects and the ongoing monitoring programs of the District to this chapter. Perhaps a table simply noting what types of monitoring is being done and if the results of such monitoring are being reflected in other projects would be sufficient to ensure the relationship between CERP projects and the adaptive management concept.*

Response #4: We will add a section in next year's report that describes the monitoring and assessment plan for the South Florida Ecosystem and how that plan is designed to detect change induced by single projects and groups of projects with a feedback loop to management and operations.

Recommendation #5: *While the methodology of informal exchanges of ideas among the various programs related to CERP goals through weekly meetings is a valid way for scientists and managers to gain information, consideration should be given to strengthening and formalizing this process. The complexity of the restoration process demands that accurate and complete information on research results be shared across the District and with other agencies involved with the management of this large and complex region.*

Response #5: The CERP multi-agency Restoration Coordination and Verification (RECOVER) group has developed a peer reviewed monitoring and assessment plan. Monitoring is conducted in the Northern Everglades, Lake Okeechobee, the Greater Everglades and the Southern Estuaries. We have created a formal process for compiling and synthesizing monitoring and research results in a System Status Report that will be prepared every two years. The first System Status Report was completed in 2007. The first System Status Report is available for review on the EvergladesPlan.org website.

RESPONSES TO COMMENTS ON CHAPTER 7B

Kimberly Chuirazzi

RESPONSES TO PEER-REVIEW PANEL COMMENTS & RECOMMENDATIONS

General Response: Regarding the SFER panel's recommendations 1-4 in their final report, the noted information is similar to those comments previously documented by the panel on the WebBoard during their review of the draft Chapter 7B. As such, responses to these recommendations can be found in Appendix 1A-5, under Chapter 7B, as previously noted by the chapter's author.

RESPONSES TO COMMENTS ON CHAPTER 8

Tracey Piccone

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Recommendation #1: *The panel requests that some comment be made in future reports between efforts to integrate this methods and outputs of what is reported in this chapter and chapter 1B with the goals and outcomes of this chapter.*

Response #1: This recommendation will be taken into consideration in future reports.

Recommendation #2: *The impact of drought on water quality should be included in the 2009 SFER. The panel feels that some information should be added on the drought contingency plans for management of various components in the system especially the STAs, noting for example, what components might be sacrificed to maintain critical functions of critical components, what criteria will be used.*

Response #2: This recommendation pertains to Chapter 5 on STA Performance and Optimization and will be considered during development of the 2009 SFER.

Recommendation #3: *Some mention of the potential importance of sulfur to water quality should be presented in the 2009 SFER, as this will obviously become a much more important research focus in the near-term.*

Response #3: This recommendation will be considered during development of the 2009 SFER.

Recommendation #4*: The title of this chapter includes the word "plan." Given that the 2008 SFER includes two "science plans" it would be helpful to have the text reflect on how the chapter 8 plan is related to their science plans proposed both upstream and downstream of the focus of the chapter.*

Response #4: Language has been added to the Final chapter in an attempt to clear up confusion about the difference between the Long-Term Plan and other District plans and initiatives.

Recommendation #5: *A short explanation of water quality monitoring activities, related to chapter 8, with those of both upstream and downstream monitoring activities would be helpful in understanding how monitoring is integrated across South Florida (and with Chapter 1B – redesign effort).*

Response #5: This recommendation will be considered during development of the 2009 SFER.

RESPONSES TO COMMENTS ON CHAPTER 9

Amy Ferriter[3] with Chapter Co-Authors

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment #1: *For the general public, it would be useful to have some overall observations or conclusions about the impacts of these species (and some indication of the key invasive and problematic ones) in the summary.*

Response #1: Acknowledged. The suggested information will be added to the Summary section of the Chapter.

Comment #2: *A table might be useful to identify the agencies and groups that are involved with the nonindigenous species problem, and what their tasks are.*

Response #2: This information is available on the Environmental Law Institute (ELI) website in a report entitled *Filling the Gaps: Ten Strategies to Strengthen Invasive Species Management in Florida*. This will be referenced in the Chapter in the interest of saving space.

Comment #3: *Much of the monitoring is still aimed at the large, invasive tree species that can be easily monitored from the air to arrive at good estimates of acreage of each species. While this is useful for these species, it does not address smaller plants and most animals that would not be visible from the air.*

Response #3: The SRF [Systematic Reconnaissance Flight] program, which targets large infestations of more obvious species, is the only monitoring system which covers the entire geographical area of the District. There are some limited monitoring programs targeting other species in certain areas of the District.

Comment #4: *The authors are to be commended for including animals in this chapter, despite the lower quantity and quality of much of the data. It is a start on a very difficult task, and Table 9-2 is excellent (although some indication of severity could be indicated by a larger letter X). The exotic plant indicators are excellent, and a similar plan should be instituted for animals. It would also be useful to take the most invasive plants and have one chart that shows them in all the regions (e.g. Table 9-4 and so on).*

Response #4: Acknowledged. The level of severity of invasive animals will be acknowledged in Table 9-2. Because the most invasive animals are already listed in tables within each Module description, in the interest of space the authors feel like yet another table highlighting the worst problematic plant species would be redundant.

Comment #5: *The descriptions are excellent, and include a short history, effects, and where it occurs, the control measures. In all cases, it would be useful if there were an introductory*

[3] Boise State University, Boise, ID

sentence in each subsection that discussed the plants to be described for that section. It would also help if for each major plant species (or animal for that matter), a statement was made about its legal use (that is, is it sold, illegal to plant?). The cross-referencing for descriptions of the same species in different modules is excellent (although in the final version it would be helpful if the editors actually put in page numbers so the reader can easily find the sections on the same species).

Response #5: Acknowledged. The authors feel that adding an introductory sentence which lists the plants to be discussed in each Module summary would contradict instructions to keep the Chapter short and would also be a redundant effort. The plants discussed in each Module, besides being clearly labeled within the text, are listed in the stoplight table immediately following the discussion section. Page numbers for species cross-referenced in different sections will be added to the final version of the Chapter.

Comment #6: *Feral cats, as duly noted for the Keys, are a problem throughout the world, and very extensive public relations programs are necessary. This effort should be greatly increased throughout South Florida and the US generally. We have not done enough about this particular problem.*

Response #6: Acknowledged.

Comment #7: *The efforts to control the most invasive and problematic plant species are on-going, and simply require more money, time and effort to prevent large-scale ecological changes to the Everglades. The occurrence of two haplotypes of Brazilian pepper is extremely interesting, with major consequences for control, duly noted. This illustrates the complexity of the control issues, and makes the report outstanding.*

Response #7: Acknowledged and appreciated.

Comment #8: *The python seems to be the species of greatest concern for a wide range of key native animal species in the Everglades, and one that will have myriad cascading effects. Every effort should be made to control them (legal, educational, removal, and reproductive control). Since pythons are egg-layers, a study should be initiated to determine where they nest and to eradicate the eggs. Breeding them in captivity should also be made illegal.*

Response #8: Acknowledged. Aggressive educational and removal efforts against Pythons are currently underway. These efforts include thoroughly studying their reproductive behavior and habits. The authors acknowledge that increased legislation banning the breeding of these invasive snakes is warranted. The enactment of more strict legislation can take a long time, even following the demonstration that select species do more harm than good. The authors hope that with documents such as this Chapter, and other items which highlight the damage nonindigenous species can do, that the need for more strict legislation will become apparent to policy makers.

Comment #9: *The recent invasion of Sacred Ibises breeding is extremely interesting, and since it is so recent, it can be controlled at this point, and this should be done now, before it becomes another Cattle Egret in North America. No efforts of control are mentioned, and they should be considered.*

Response #9: While no control efforts have yet been devised for this species, researchers at Florida Atlantic University are actively engaged in work on this topic. Information will be included in the SFER as available, but likely will not be part of the 2008 report.

Comment #10: *The complexities of the feral hog problem typify the problems of invasive species generally. There are often interests that want a given species to remain, and how to deal with different stakeholders is critical (and this topic may deserve a species workshop overall).*

Response #10: Acknowledged.

Comment #11: *Given the problems with reptiles in this and other modules within the region, it seems prudent to convene a workshop to address these problems, figure out the best control measures for each species, and talk about overall funding, as well as a public education program. Some of these species promise to create even bigger problems if they expand into some of the other regions.*

Response #11: Acknowledged.

Comment #12: *The feral hog removal experiment seems quite critical to understanding the problem in other regions of Florida, and deserves a little more attention (especially for the public readers of this report, and in light of conflicting stakeholder interest in the species). There should be expansion of the types of damage they caused, and to what species.*

Response #12: The known damage caused by the feral hog were included in this Chapter, as well as the main points of the studies conducted on feral hogs. In the interest of saving space for this Chapter, the authors hoped their efforts would alert readers to ongoing research and would provide readers with the sources of that information for further perusal at the readers' discretion.

Comment #13: *Non-indigenous species have the potential to drastically affect almost every aspect of the structure and function of the Everglades area. Thus, their effects should be integrated into many of the chapters, including Ecology of the Everglades (6), Everglades research plan (6-1), Comprehensive Everglades Restoration Plan (7A), Lake Okeechobee (10) and Kissimmee Basin (11). Further, nonindigenous species are affecting the efficacy of the performance measures, and can potentially have a greater effect than any other factor (including quantity and quality of water).*

Response #13: Acknowledged. The authors agree that nonindigenous species have the potential to drastically affect almost every aspect of the structure and function of the Everglades area. This topic is discussed in other Chapters, but Chapter 9 serves as the main repository of invasive species issues and information.

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Recommendation #1: *The Summary should mention some of the worst exotic species problems (plant and animal), as well as some (albeit few) "success stories" in their management, control or eradication (e.g.* Caulerpa *in coastal areas) to show that, at least for some species, with concerted effort it can be achieved.*

Response #1: Acknowledged. The suggested information will be added to the chapter.

Recommendation #2: *The various sections should be checked for parallel organization.*

Response #2: Acknowledged.

Recommendation #3: *Include a flow chart of agencies/entities engaged in assessment and management of which nonindigenous species within each module.*

Response #3: Information is available on the Environmental Law Institute (ELI) website in a report entitled *Filling the Gaps: Ten Strategies to Strengthen Invasive Species Management in Florida*. This will be referenced in the Chapter in the interest of saving space.

Recommendation #4: *Integrate the presence and effects of non-indigenous species into the overall research plans, including Everglades Research Plan (chap 6-1) and the Coastal Ecosystem Research Strategy (chap 12-1).*

Response #4: The authors have discussed Comments 17-19 at length with various District staff. To date, nonindigenous species have not been integrated into District Research Plans or Performance Measures. The District plans to facilitate an in-house meeting to discuss ways this can be accomplished in the future. The authors will include information related to these issues as they become available.

Recommendation #5: *Examine the effect of invasive species on performance measures.*

Response #5: See above.

Recommendation #6: *Relate nonindigenous species management and control to specific recovery goals, which relates to a management strategy and evaluation of the overall critical species to control.*

Response #6: See above.

RESPONSES TO COMMENTS ON CHAPTER 10

Joyce Zhang and R. Thomas James

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Recommendation #1: *Give in this chapter more information about the levels of mercury in the fish populations in the lake. It was dismaying to learn that Lake Okeechobee's limits for mercury are among the least restrictive of all advisories in Florida.*

Response #1: Information provided. Fish samples show mercury levels are so low that fish consumption need not be restricted.

Recommendation #2: *Include in the chapter more information known about Nymphaea abundance in the lake and whether an increasing abundance is beneficial or detrimental to the lake ecosystem.*

Response #2: Included specific information that is available.

Recommendation #3: *The information on water quality monitoring (p.10-36) would be strengthened by discussion of the compatibility of techniques used over time by the District and others. Give more details whether techniques have been consistent over time.*

Response #3: Revised.

Recommendation #4: *It is important to understand plans for assessing the overall impact of exotic species (plants and animals) on the Lake ecosystem. It would seem that such information would be needed to assess the effectiveness of some performance measures. Thus, we recommend that a detailed table of the exotic plants and animals that inhabit Lake Okeechobee be included in this chapter. We suggest that the table indicate what is known about each species' distribution in the Lake; what is being done to monitor each one; what is being done to attempt to manage or control each one; particular species of concern for the Lake ecosystem that are not being managed; and plans to address those species of concern.*

Response #4: The District added the following text: "Although a list of non-indigenous animals in south Florida has been developed (Table 9-2), the distribution and effect of these exotic and potentially invasive animals within the Lake Okeechobee Ecosystem is unknown. To handle this concern, an integrative approach is needed. A proposed first step is a meeting of District scientists from the various Divisions that may be concerned about exotic animals to discuss preliminary actions that could be taken. Because this problem is one of state and national interest, these preliminary actions will be relayed to the Florida Invasive Animal Task Team (FIATT). The expectation is that a multi-agency plan to assess and manage non-indigenous species posing the greatest environmental threat to the ecosystems of south Florida will be developed."

Recommendation #5: *It is recommendable to expand the experiments described on page 10-64 " Light influence on the growth and germination of submerged aquatic vegetation" with more interacting factors e.g. phosphorus in the sediment.*

Response #5: These will be considered in the future as time and resources permit.

Recommendation #6: *The chapter describes atrazine and hexazinone as relatively nontoxic to mammals, but conflicting information occurs in the literatures, especially considering insidious, chronic impacts. Additional discussion with supporting references is needed in this chapter.*

Response #6: More detailed information provided.

Recommendation #7: *Although this chapter provides an excellent compilation on environmental conditions, District activities, and restoration progress for WY2007, it still needs more integration with other chapters. It would be strengthened by additional integration summarizing effects of the lake in WY2007 on the St. Lucie and Caloosahatchee estuaries.*

Response #7: Will continue working on the integration.

Recommendation #8: *The chapter should include a description of plans to account for potential impacts on the lake from urban/suburban development affecting the upper watershed.*

Response #8: The strategies to reduce impacts from urban/suburban development in the Lake Okeechobee watershed are included in Lake Okeechobee Protection Plan. Activities since the inception of the Lake Okeechobee Protection Act include implementation of BMPs, master planning for stormwater and wastewater, implementation of stormwater retrofits, the designing of larger urban stormwater projects, and public education. FDEP is the leading agency for this effort.

RESPONSES TO COMMENTS ON CHAPTER 11

Steve Bousquin with Chapter Co-Authors

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Recommendation #1: *Efforts should continue to develop a plan of selected approaches for modeling and monitoring of phosphorus movement and retention, legacy P (P storage), and present/future P loading. A study of P assimilation/release should be completed as wetlands are restored in the Pool D floodplain and flow is diverted to remnant channels.*

Response #1: Plans for further evaluations of phosphorus are described on lines 1153-1172 (phosphorus section).

Recommendation #2: *Explanation should be included as to how the accountability of KRRP will be evaluated as restoration efforts continue, and how the Kissimmee restoration plans will be integrated with management of exotic plant and animal species.*

Response #2: A discussion of KRRP accountability and information on exotic plants and animals in the restoration area was added starting at line 306.

Recommendation #3: *The authors' clarification about why minimum DO has not been used as a PM should be included in the chapter, as well as information about the number and locations of continuous DO monitoring stations . . .*

Response #3: Clarification of why minimum DO was not used as a performance measure was added to the DO section of the chapter, as well as information about the number and locations of continuous DO stations.

Recommendation #3A: *. . . In addition, the chapter writing should be tempered to consider that chronic, physiological DO stress to fish health beyond overt signs such as fish death or fish gulping air at the water surface are known to occur from hypoxic conditions (< 4 mg DO/L), especially for sensitive young life history stages.*

Response #3A: Additional information and clarification on the fish kill and DO stress was added starting at line 735.

Recommendation #4: *Information that clarifies various points should be added to the revised chapter, including the relative contribution of agriculture versus other sources of phosphorus;*

Response #4: This information has been added on lines 456-468 (Kissimmee Basin Water Quality section).

Recommendation #4A: *… changes in P loads since 2001;*

Response #4A: This is addressed in the phosphorus section (lines 1097-1110 and Figures 11-11 and 11-12).

Recommendation #4B: *. . . the effects of restoration construction activities on P spikes;*

Response #B: This is addressed at the end of the phosphorus section on lines 1173-1180.

Recommendation #4C: *. . . the historical perspective on snail kite nests;*

Response #C: Included in chapter starting at line 734.

Recommendation #4D: *. . . the source of spoil material for backfilling efforts;*

Response #D: Information added to chapter starting at line 264.

Recommendation #4E: *. . . consideration of benthic (and other) invertebrates in restoration efforts;*

Response #4E: A list of restoration evaluation studies including studies of benthic and other invertebrates has been added at line 862.

Recommendation #4F: *. . . rationale regarding present efforts to restore pre-channelization floodplain vegetation (present higher proportion of wetland shrub species vs. broadleaf marsh species);*

Response #4F: Information on shrub community responses added to the chapter starting at line 1218.

Recommendation #4G: *. . . and the District's public outreach component in the Kissimmee basin.*

Response: This information has been added to the chapter at line 1362.

Recommendation #5: *Increased phosphorus levels at the southern end of Lake Kissimmee are as yet unexplained, and could confound management goals. The sustained drought impeded work to resolve the sources. This important work should be emphasized as soon as climatic conditions permit, with progress assessed in the 2009 SFER.*

Response #5: This is addressed on lines 1111-1116 in the phosphorus section.

Recommendation #6: *It was encouraging to learn that, because of recent changes to LOPA (the Lake Okeechobee Protection Act), the Lake Okeechobee Works of the District Rule is being revised to include the Upper Kissimmee basin, so that implementation of BMPs will be required of landowners, rather than on a volunteer basis. More information about mandatory BMPs in the Upper Kissimmee basin should be included in future SFER's once this revision to the rule is in place.*

Response #6: We will include updates on BMP implementation in future SFER chapters as information becomes available.

Recommendation #7: *Explanation should be included on the entities that monitor mercury in the Kissimmee basin, as well as a description of mercury concentrations in fish tissues, background information on mercury levels that impair fish health (all life stages of major species), and a brief summary of mercury advisories.*

Response #7: In the Mercury section (lines 522-538), the discussion on available data, water body impairments, fish consumption advisories, and plans for further evaluation by the SFWMD has been expanded.

Recommendation #8: *The District's planned detailed monitoring study of submersed aquatic vegetation in KCOL lakes will provide valuable information and should be completed.*

Response #8: Clarification was added to the chapter at line 755.

RESPONSES TO COMMENTS ON CHAPTER 12

Richard Alleman, Peter Doering and David Rudnick

RESPONSES TO FINAL PEER-REVIEW PANEL RECOMMENDATIONS

Comment #1: *The Panel recommends that the Summary be strengthened so that it is more representative of the work done in developing the Science Plan but also that carried out in the major estuaries within the District's jurisdiction.*

Response #1: Concur. The summary was strengthened in the 2008 report.

Comment #2: *The Panel recommends that Table 12-1 be enhanced by:*

a. Denoting more clearly the major parts of the Science Plan currently indicated in the heading of the first column of each page;

b. Including the status of the MFL's in each estuary; and

Response #2: Concur. We will consider these improvements to the table in the 2009 report. Reference was included in the 2008 report about the status of MFLs contained within Chapter 3 of Volume 2 as appropriate.

Comment #3: *c. Including as practical basic information on each estuary (see comment 4a below);*

As has been pointed out by the Panel in the past two SFER report reviews, there still appears to be little review, analysis, and incorporation into the District's coastal work, especially for the determination of and impacts of freshwater inflows, of research performed outside of Florida. While the District has developed a strong approach to estuarine management, it could be stronger if experience gained in other states with freshwater inflow management was incorporated, and the Panel recommends that the CEP take advantage of the work done elsewhere on coastal ecosystem management, particularly the management of freshwater inflows to keep estuaries functioning as estuaries.

Response #3: The District reviews all literature that may be useful to help form hypotheses, interpretation or conclusions about coastal systems. For example, a literature review has just been completed for Biscayne Bay where 57% of the literature is from other areas besides Florida. A wide variety of literature is typically not cited in Chapter 12 of the SFER.

Comment #4: *For each estuarine system, the Panel recommends that additional information be provided routinely on an annual basis to get a sense of the "state of the bay", namely:*

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

b. Hydrologic characteristics such as annual average inflows by year for previous 20 years at least, annual average hydraulic residence times, average annual constituent residence times taking into account tidal exchange, and fraction of freshwater based on annual average salinities;

c. Water quality characteristics such as annual average concentrations and temporal variations of key constituents (e.g., salinity, DO, organics, and nutrients) bay wide and spatially that conveys general information about water quality conditions throughout the estuary;

d. Biological data such as general concentrations (volumetric, areal, etc. as appropriate) of primary producers (e.g., phytoplankton, submerged aquatic vegetation) and secondary producers (e.g., zooplankton, benthic organisms, key species/VEC's), and associated organisms.

Response #4: We concur that where data are available it would improve the chapter by including information characterizing each of the estuaries. We will consider including this type of information in future versions of the SFER for highlighted water bodies.

Comment #5: *The Panel recommends that a short section (i.e., no more than half a page each) be added to each estuary describing the mathematical models that have been prepared and their status. This additional information would balance the descriptions provided of sampling programs for water quality and biota and other material provided. Any efforts to develop and apply simplified models (e.g., CSTR, plug flow, dispersive flow) and intermediate models (e.g., finite segment models in one-, two-, or three dimensions) should be described as well.*

Response #5: Concur. This type of information will be included in the individual estuary science plans as they are developed. As the science plans are completed, the information will be summarized in future versions of the SFER.

Comment #6: *For each estuarine system, accountability needs to be addressed via a statement as to how the hydrologic and water quality modeling, water quality data, and biological data are being used to manage this estuary at the present time, how water management in the watershed upstream relates to that management, and how well water quality goals have been met during the year. While District staff state their intention to provide such linkages when each of the individual science plans are fully developed, the Panel strongly recommends that those management objectives be recognized and stated up front and that the science plans incorporate those objectives.*

Response #6: The status of achieving MFL criteria, primary management objectives of the District, was described. We intend to indicate linkages of science strategies to management objectives in individual estuary science plans as they are developed, while reporting on the status and results of science projects in the Chapter. We included cross-references to Chapter 7B, where the results are compared to performance measures developed for CERP or RECOVER. We concur that where water quality objectives have been adopted, future versions of the SFER may include the results compared to water quality goals, and how results have been used to determine strategies especially in the highlighted water body. Instances where model results have been applied to management will also be highlighted.

Comment #7a: *Specific comments on each estuarine system are below:*

Southern Indian River Lagoon and St. Lucie River and Estuary – While District staff noted that VSS would be considered for the Northern Everglades Initiative study and used in the calibration

of the sediment module of the CH3D water quality model, the Panel recommends that water quality monitoring include a measure of organic materials such as Volatile Suspended Solids or Total Organic Carbon in the water column to complement other nutrient constituents.

Response #7a: Concur. The two water quality sampling programs in this area address the tributary inflows and the receiving water body. These programs are being revisited as part of the Northern Everglades Protection Plan and will consider adding Volatile Suspended Solids (VSS) to the analysis of Total Suspended Solids (TSS) presently determined. Additionally, future efforts to calibrate the sediment module of the CH3D water quality model will include intensive measurements of VSS and TSS.

Comment #7b: *Loxahatchee River Estuary – The Panel continues to recommend that more than one transect be maintained in the lower tidal area of the Northwest Fork to support detection of long-term changes in that area.*

Response #7b: The transect locations were chosen to address the loss of cypress and the condition of freshwater floodplain vegetation in terms of variety in upper tidal and lower tidal floodplain vegetation due to salt water intrusion in the tidal reach and inadequate hydroperiods in the riverine reach. The mangroves are the predominant vegetative species, almost to the exclusion of other vegetative species in the area of Transect 9-1 at RM 6.46 or lower tidal reach. Therefore, multiple transects in the tidal reach of the Northwest Fork were not identified and established.

Comment #7c: *Lake Worth Lagoon – The Panel recommends that the concern about sedimentation and turbidity that was raised but not explained in this section be addressed as well as whether shallowing of the Lagoon due to sediment deposition measured and whether it was considered as a cause for water volume decrease and hence salinity decrease.*

Response #7c: Water quality issues such as sedimentation and turbidity in Lake Worth Lagoon may be discussed in future SFER reports when strategies to improve the water quality are implemented by the District. Muck up to a foot in depth has been observed in the central part of the lagoon, but models have not been used to test the hypothesis that shallowing is affecting salinity. It is unlikely that this modeling scenario will be addressed in 2008 since the emphasis will be on the northern estuaries, but the question can be added to the Lake Worth science plan.

Comment #7d: *Biscayne Bay – The Panel recommends that results of salinity distribution in the Bay be presented in the 2009 Draft SFER Report as well as other water quality constituents as available.*

Response #7d: We presented long term salinity results distributed throughout Biscayne Bay. We will consider enhancing that information that includes information about other water quality constituents in future reports.

Comment #7e: *Florida Bay – The Panel recommends that District staff continue to quantify the sources of nutrients that led to the algal bloom in eastern Florida Bay and southern Biscayne Bay as the explanation for the source of the bloom does not yet appear to be resolved.*

Response #7e: We indeed are cautions in attributing cause to complex ecological phenomena, such as algal blooms. We do make clear that the weight of evidence points to multiple causes of bloom initiation (road construction and storm disturbance) and bloom sustenance (road construction and SAV die-off). We depend upon empirical information to provide inference, but recognize that such evidence neither provides proof nor an ability to precisely apportion the strength of influence among multiple factors.

Comment #7f: *Naples Bay – The Panel recommends that District staff clarify the resource needs and time frame for developing more components of the Science Plan for this bay.*

Response #7f: The timeframe for further developing more components of the Naples Bay plan is not clear at this time. In the short term, the focus for the District will be on the northern estuaries.

Comment #7g: *Estero Bay - The Panel recommends that District staff clarify the resource needs and time frame for developing more components of the Science Plan for this bay.*

Response 7g: The timeframe for further developing more components of the Estero Bay plan is not clear at this time. In the short term, the focus for the District will be on the northern estuaries.

Comment #7h: *Caloosahatchee River Estuary and Charlotte Harbor – The Panel recommends that the results of additional nutrient limitation studies be presented in the 2009 Draft SFER Report and that District staff clarify the resource needs and time frame for developing more components of the Science Plan for this bay.*

Response 7h: The timetable for finishing the Watershed and River Protection Plan is due to the Florida Legislature in January 2009. This document will include a Research Plan for the Caloosahatchee Estuary. Results of nutrient limitation studies will be presented.

2008 SFER – Volume I
Authors' Responses to Comments

Part II:
Responses to Comments on Special Review Topics

This section includes authors' responses to comments in the 2008 SFER panel's Final Report (Appendix 1A-6) on appendices presented as special review topics in this year's SFER.

Volume I special review subjects include:

- Hydrologic Monitoring Network of the South Florida Water Management District
- Sulfur as a Regional Water Quality Concern in South Florida
- Environmental Responses to Water Management in the Everglades: A Strategic Research Plan for the Everglades Division
- Coastal Ecosystems Division Science Plan

RESPONSES TO COMMENTS ON APPENDIX 2-1

Chandra Pathak with Contributing Authors

RESPONSES TO PEER-REVIEW PANEL COMMENTS & RECOMMENDATIONS

Regarding the SFER panel's recommendations in their final report, the noted information is similar to those comments previously documented by the panel on the WebBoard during their review of the draft Appendix 2-1. As such, responses to these recommendations can be found in Appendix 1A-5, under the Appendix 2-1 section, as previously noted by the chapter's author.

RESPONSES TO COMMENTS ON APPENDIX 3B-2

Mark Gabriel

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Overall, the authors for *Appendix 3B: Sulfur as a Regional Water Quality Concern in South Florida* concur with panel recommendations regarding future sulfur management activities within the EPA (Everglades Protection Area) including their proposed "two-pronged" research approach. The following bulleted items detail the District's current research effort.

Large Scale Sulfur Mass Balance Study –

[Responds to Panel Recommendation #1]

- Mass balance developed for the EPA to better define sulfur exchange between the major landuse regions [EAA (Everglades Agricultural Area), urban, Lake Okeechobee] including atmospheric deposition; Surface water sampling will occur at major structures and should be on a monthly basis.

Small Scale Sulfur Mass Balance Study –

[Responds to Panel Recommendation #2]

- Performing a closed system mass balance on an STA cell(s) to characterize important mechanisms, e.g., hydrogen sulfide liberation, sulfide production, plant uptake, sedimentation, with specific mass inflows and outflows

STA/EPA Internal Eutrophication Study –

- An internal eutrophication study will be completed by DB Environmental; a refined proposal is currently being developed.

Hg/Sulfur Biogeochemistry Study –

[Responds to Panel Recommendation #3]

- Future mercury biogeochemistry research efforts within the EPA are primarily being led by FDEP (Florida Department of Environmental Protection). The District plans to develop smaller focused studies (e.g. investigating the "sulfur break point" and evaluating environmental data at mercury hotspots within the EPA), while making use of existing data.

RESPONSES TO COMMENTS ON APPENDIX 6-1

Everglades Division

RESPONSES TO PEER-REVIEW PANEL COMMENTS

General Response: Unless noted otherwise, all the questions and concerns outlined below by the Review Panel are addressed in Appendix 1A-5 and have resulted in modifications to the appendix of concern.

TECHNICAL REVIEW

Comment #1: *This chapter is an excellent overview of water management strategies, and provides a good description of organization, problems, and possible solutions. The inclusion of a table of contents makes it easier for the reader to find subjects. The introduction and background clearly lays out the objectives, priorities, and implementation plans. As such, it is a clear statement with finite and do-able objectives. The organizational chart listed on the first page, however, is confusing; it is unclear how this relates to anything else in the document. It would also help the organization if a paragraph were added to the end of the introduction that briefly summarizes the organization of the rest of the chapter.*

Table 6A-1 is extremely important as a basis for understanding the overall Everglades research plan in relation to clear goals and objectives. The authors are to be congratulated on making the research objectives clear.

This is an opportunity for the program to add areas that clearly need addressing, and should be placed within the water management area. Invasive species is one such area that seems to be missing from this chapter, and in the invasive species chapter, several of the species seemed to be partly dependent on water level regimes. For example, are there any plans to determine whether invasive fish are having an effect on fish communities such that prey are less available to wading birds? In this same line, it would be useful to make sure that tribal interests are included in the synthesis area.

There should be a clear connection between the hypotheses and the individual studies being described. That is, it should be easy to see which hypothesis an individual study is addressing. While these are explained in Table 6a-1, it should also be stated under each study. Perhaps these could be placed under management and restoration objectives, making the chapter more reader friendly.

Response #1: (a) The organizational table on the cover page is there for District Management and Human Resources to document participation in the development of this Strategic Research Plan. (**b)** Invasive species is the research domain of the Vegetation management Division. Our role in the Everglades Division is to add support and expertise for focused studies. Tribal interested are included within the District's Adaptive Management programs. (**c)** We agree that clear hypothesis and ones written in the format of a testable null format would improve this document and it is our intention to add this text in the next Strategic Plan Update.

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Recommendation #1: *Consider the relationship of the science plan to the decisions that will be made in the next year, and beyond.*

Response #1: We agree, the science plan must focus on critical management decisions associated with system restoration and sustainability. We adopted the RECOVER hypotheses to help guide this plan because most decisions will come from the need to implement CERP.

Recommendation #2: *Develop methods and procedures (such as dedicated workshops, forums, regular conference calls) to integrate the science questions of decision-makers into the overall research strategy.*

Response #2: Integration of the needs of the decision-makers with the research strategy is vital to a truly applied science program. We have a long history of workshops designed to develop conceptual models that focus our research questions and priorities.

Recommendation #3: *Develop methods and procedures (such as workshops, newsletters, hot-live phone numbers) to integrate the science questions of stakeholders into the overall research strategy.*

Response #3: Incorporation of stakeholders concerns into the research strategy is vital to an Adaptive Management (AM) program. We intend to follow the AM procedures developed by RECOVER to implement this recommendation.

Recommendation #4: *Develop an overall framework for understanding the relationship between accelerated recovery and natural recovery (times, approaches, methods).*

Response #4: Good point and it is our intention to use the control plots associated with the CHIP and FIRE experiments to document natural recovery rates in the field. Experiments in our greenhouse, LILA or macrocosms will be considered for specific hysteresis questions.

INTEGRATIVE REVIEW

Recommendation #5: *The Plan explains that research project linkages with each other are not shown in a conceptual diagram because it would "look like spaghetti". Nevertheless, it acknowledges that such a diagram would be useful in revealing strong linkages, dependencies, and critical paths (line 139). A nice example of an integrative diagram is shown in Figure 6A-3; it would be helpful to include such diagrams for the other sections.*

Response #5: We will incorporate more integrative diagrams in the next iteration of the Research Plan.

RESPONSES TO COMMENTS ON APPENDIX 12-1

Coastal Ecosystems Division

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment #1: *There is confusion about interchanging the terms "research strategy" and "plan". Appendix 12-1 unfortunately does not include strategic scientific plans to address the four major objectives that are the stated focus. The writing does demonstrate in-depth understanding of the "state of the art in coastal science", but clear plans for each coastal ecosystem are lacking. In addition, the research framework described for use in developing plans for these systems is based mostly on freshwater flow and salinity limits, and does not include consideration of nutrients carried with these flows, which are vital to the productivity of these systems.*

Response #1: We have revised the conceptual model shown in Figure 2 to include nutrients. The model also includes both primary and secondary production that are supported by these nutrients.

Comment #2: *As indicated, a clear plan for addressing the water quality, water quantity, and habitat problems for each coastal ecosystem is lacking. It is also difficult to determine timescales of the plans (e.g. Table 6, Timeline column). There is, however, a general research framework presented that can be used to develop plans.*

Response #2: We agree that fully developed science plans for each system are lacking. It is our plan to concentrate on developing plans for one or two systems each year. As recommended (see below), what were formerly called "Water Body Science Plans" are now called "Program Inventories and Some Planned Activities". Text for each individual water body has been modified to reflect this change. The Loxahatchee is an exception. The Science Plan presented in appendix 12-1 is the Science Plan that was developed as part of the Restoration Plan for the Northwest Fork of the Loxahatchee River.

Comment #3: *Objective 2 – Improve operation of District Infrastructure – Two identified components are provision of weekly input based on the status of the Caloosahatchee and St. Lucie estuaries (based mostly on best professional judgment), and application of science (evaluation of different discharge scenarios, development of improved predictive tools) to the operational rules and protocols of District infrastructure. The Caloosahatchee and St. Lucie evidently were selected as the "marker" coastal ecosystems to address this objective because "larger projects" (line 388) are being built there.*

Response #3: They were also selected because they are artificially connected to Lake Okeechobee and significant flood control releases are made from the Lake to both these estuaries.

Comment #4: *The projects described are reasonable and valuable, but strategic planning is not clear. The Florida Bay plan (Appendix 6-1) provides a strong template that could be followed to clarify, strengthen, and/or develop strategic science plans for each coastal ecosystem in Appendix 12-1.*

Response #4: As we generate science plans for each water body, we will consider the Florida Bay plan as a template.

Comment #5: *The background section demonstrates knowledge of "state-of-the-art" estuarine/coastal science. This section also provides the very general conceptual model used as an overall framework for the CED Science Plan. The authors clarify the important point that while the conceptual model integrates science, it does not address temporal and spatial variability. The next section, "Summary of Coastal Ecosystem Models", has a helpful table of estuary and watershed models that the CED has applied in each coastal ecosystem that shows where (by coastal ecosystem) and how the CED has applied various models to date. This section might better be included as the last subsection of the "Background" section.*

Response #5: For the time being, we have not moved the table.

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Recommendation #1: *The title of this document does not describe the contents of Appendix 12-1 and should be changed to "A Generalized Applied Strategy for Developing Research Plans for the Coastal Ecosystems". Other writing in the Appendix should also be altered accordingly.*

Response #1: We concur that the "Science Plan" could have a different title. On the other hand, a science plan can present a generalized research strategy (Integrated Modeling and Resource Assessment Framework) as ours does. Developing science plans for individual water bodies is only one of several ways to use the Framework.

Recommendation #2: *The "Water Body Science Plans" section should be entitled, "Program Inventories and Some Planned Activities", as science plans are not contained within it. The extensive descriptive information about each ecosystem, mostly taken directly from [2008 SFER, Volume I] Chapter 12, should be omitted since it does not contribute toward the goal of providing a clear strategic science plan for each system.*

Response #2: As recommended (see below), what were formerly called "Water Body Science Plans" are now called "Program Inventories and Some Planned Activities". Text for each individual water body has been modified to reflect this change. The Loxahatchee is an exception. The science plan presented in Appendix 12-1 is the science plan that was developed as part of the Restoration Plan for the Northwest Fork of the Loxahatchee River which has been accepted by the Governing Board of the District.

Background material was included since the science plan was intended to be a stand-alone document. The background material provides the context and foundation for future work. The individual science inventories will be expanded to strategic science plans over the next few years. Our plan is to create science plans for the Caloosahatchee and St. Lucie over the next few years.

Recommendation #3: *The general framework being considered to develop plans for the coastal ecosystems is based mostly on freshwater flows and salinity limits, and should be expanded to include consideration of major water quality parameters such as nutrients and toxic substances, as well as the roles of exotic and invasive species (influences on performance measures).*

Response #3: We have revised the present document to place more emphasis on nutrients and the primary and secondary production that these nutrients support. Specific additions have been made to the discussion of Alber's conceptual model. An additional example of the application of the Framework to water quality issues has been added.

At present the District does not monitor or conduct research on toxic substances in estuaries, nor does it monitor or conduct research on exotic or invasive species in estuaries.

Recommendation #4: *The Florida Bay plan (Appendix 6-1) provides a strong template that should be followed to develop strategic science plans for each coastal ecosystem in Appendix 12-1. In Appendix 6-1, the Florida Bay strategic science plan (which should be mentioned in Appendix 12-1, although a small amount of overlap is included in the [incomplete?] coverage of Florida Bay in Table 2) is framed around several key hypotheses that guide the research. It includes an Application of Results section that is well conceived and clearly presented. It provides a strong illustration of project integration, planned through several levels of numerical analysis including calculations of improved nutrient budgets, statistical analyses/models of monitoring/Dataflow data, mass balance modeling, and dynamic water quality modeling. In the seagrass component, the approach to understand interactions of freshwater flow, salinity, water quality, and seagrass dynamics is planned to integrate modeling, fieldwork and laboratory research including a strong set of mesocosm studies to measure nutrient uptake and kinetic parameters of seagrasses under different inter-specific competition treatments, strengthened by field verification studies to "ground-truth" the data.*

Response #4: As we formulate science plans for each individual water body we will explore the use of the Florida Bay Plan as a template.

Recommendation #5: *A table should be added after Table 1 that provides examples of different levels of complexity of linked models to address estuarine water quality issues.*

Response #5: Since our water quality modeling efforts have just begun, such a table was not produced this year. Such a table will be included in future versions of our science plan.

Recommendation #6: *For Objective 4, Appendix 12-1 should clarify the extent to which the District has been successful thus far in rehabilitating estuarine habitats.*

Response #6: On a regional scale, RECOVER [*see 2008 SFER, Volume I, Chapter 7B*] will be monitoring restoration of estuarine habitats, primarily seagrasses and oysters. We will include local information in future versions of [SFER, Volume I] Chapter 12, as different systems are highlighted.