Appendix 1A-4: *2007 South Florida Environmental Report –Volume I* Authors' Responses to Comments

A panel of outside experts provided peer review of the *2007 South Florida Environmental Report* through WebBoard comments, participation in a two-and-one-half day public workshop, and a written final report (Appendix 1A-5). Authors revised their chapters and related appendices responsively. This appendix includes authors' responses to major comments 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.

Information to supplement this appendix is provided at the District's 2007 Draft SFER Peer Review and Workshop website at http://www.sfwmd.gov/sfer/SFER_2007/workshop/workshop_07.html. This website provides links to authors' workshop presentations, including their responses, and to WebBoard postings through the September 29, 2006, public review and comment period.

2007 SFER – Volume I
Authors' Responses to Comments

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

RESPONSES TO GENERAL PEER-REVIEW COMMENTS ON THE 2007 SFER

On page 4 of the panel's final report, there are five general recommendations on the following SFER-related topics: (1) integrating water quality, (2) developing an integrated South Florida water monitoring strategy, (3) documenting report authorship, (4) reporting on sulfur in South Florida, and (5) linking the connection between research and management goals. Responses to these general recommendations are provided below:

INTEGRATING WATER QUALITY

The South Florida Water Management District (District) and the Florida Department of Environmental Protection (FDEP) will work together to implement this recommendation in a phased manner for future SFERs. When considering true integration of water quality reporting across the region, the agencies are faced with a large array of different program's interests, datasets, and parameters. Importantly, it is recognized that the forced integration as some form of compilation of this massive information could lead to an unwieldy product that would not be an effective consolidation. Thus, the challenge for the agencies is how to further integrate water quality information, as recommended by the panel, while at the same time, maintaining the ability to communicate such information in a concise, efficient manner and fulfill statutorily mandated reporting requirements. More interaction between both agencies will be needed in determining how to move forward, and therefore as a first step, an interagency working group on water quality will be formed to develop an approach to an integrative section of Chapter 3. As a starting point, this section will parallel the type of integration presented in this year's Chapter 1B, with the inclusion of additional constituents and supporting level of detail, as recommended by the working group.

At this time, it does not appear practical or even possible to take all water quality data from the various SFER chapters and somehow integrate this information into a single chapter or section, particularly considering its magnitude and diversity. It should be noted that water quality analyses conducted for the various regions across South Florida are often implemented for different purposes and to satisfy various regulatory mandates. The detailed analyses presented in Chapters 3A and 3C have been developed specifically to fulfill requirements of the Everglades Forever Act. In contrast, the mandate to perform similar analyses in other South Florida regions is being addressed through the FDEP's TMDL Program and implemented pursuant to the state's Impaired Waters Rule. As this state-wide program proceeds, it is likely that additional information on water quality will be reported both in the specific chapters and on integrative aspects, such as a dedicated section of Chapter 3, in future SFERs.

SOUTH FLORIDA WATER MONITORING STRATEGY

The District and the FDEP concur with the panel regarding the importance of data consistency, specifically the manner in which data are compiled from the District's DBHYDRO database. The agencies further agree that efforts to standardize the water quality assessment process are very worthwhile. Notably, SFER authors have made thorough efforts to ensure reasonable consistency of datasets and assessment methods among reporting years. These efforts include detailed documentation of data sources, data handling, and methods in each annual report update. While annual queries of DBHYDRO may result in some different records from year to year, the SFER

authors have attempted to minimize variations and to document any changes in annual SFER updates. To further enhance such efforts, the District and FDEP will use the same water quality working group noted above to improve standardization and consistency in the stations and associated data used in the SFER to assess compliance with standards and water quality status and trends. Progress on this monitoring strategy will be reported in the 2008 SFER and it is expected that this will be a continuous process over the next few years, with yearly guidance from the panel on future content and direction.

DOCUMENTING REPORT AUTHORSHIP

The SFER Production Team will work with the authors this year and in the future to provide consistent guidance on authorship for the SFER chapters and appendices. The SFER Production Team seeks to document authorship that reflects the various roles of the many authors. However, the final decision on documented authorship and contributorship of each chapter and appendix will rest upon their respective authors.

REPORTING ON SULFUR

The FDEP, along with its partnering agencies including the District, concurs that Chapter 3B and its associated appendices presented on mercury- and sulfur-related monitoring, research, and assessment needs further refinement to provide a clearer presentation of this material. As such, the agencies will work together to implement this crucial recommendation in future reports. Given the importance of sulfur and its role in causing or contributing to adverse impacts in the EPA, an additional chapter or section on sulfur with supporting appendices will be added in future SFERs to improve annual reporting and will detail the following suggested areas: (1) quantify sulfur sources and highlight status and trends of sulfur across the South Florida region, (2) analyze these patterns and better define the problematic relationship between mercury and sulfur, (3) evaluate other sulfur effects on the ecosystem including phosphorus dynamics and sulfide toxicity, (4) state hypotheses and related research efforts, (5) present and evaluate supporting data, and (6) provide conclusions and recommendations, as well as their connectedness to current and future restoration and management goals. It is anticipated that this enhanced reporting will further identify data gaps and make specific research and monitoring needs more apparent in future expert panel reviews.

CONNECTING RESEARCH AND MANAGEMENT GOALS

The South Florida Water Management District and collaborating agencies agree with the panel's overall intent on communicating the linkages between technical information and management goals. As part of the District's overall annual reporting process, each year the Strategic Plan provides the basis for setting agency- and program-specific priorities, strategies, and success indicators, along with their associated deliverables and milestones. This information is intended to thread the connections between current and projected programmatic efforts with overall management goals. For future SFERs, the Production Team will work with authors to better interconnect the agency's strategies, priorities, and success indicators with the findings of individual chapters. Chapter-specific descriptions and format, such as summary tables, will be up to the individual authors' discretion to determine the best manner for presenting these linkages.

On pages 5–7, the panel makes several suggestions for the 2008 SFER as well as comments on the 2006 SFER Executive Summary. Responses to these recommendations are provided below:

2008 CROSS-CUTTING THEMES

The recommended cross-cutting themes for the 2008 SFER provided by the panel are worthy of careful consideration and will be discussed at the project kick-off meeting for the development of next year's report, scheduled in spring 2007. In this organizational meeting, the District and the FDEP will explicitly discuss cross-chapter integration and will determine which of the suggested themes, or an alternate topic based on current issues or needs, will be most suitable for the 2008 report.

2006 EXECUTIVE SUMMARY

The District greatly appreciates the panel's thoughtful comments on last year's SFER Executive Summary. With regard to the panel's suggestions on reorganization and adding other sections, it is not clear at this time how these changes could be implemented while addressing other needs and expectations of this document. Carrying over the organization from earlier Everglades Consolidated Reports, the chapter-by-chapter structure of the SFER has been a common theme to unify the presentation of both Volume I and Volume II summaries. The Executive Summary is also intended to mirror the Main Report and provide chapter-specific highlights for the more general reader as well as a clear road map to those readers interested in further detail in the Main Report and associated appendices, including statutorily mandated information and updates. The SFER Production Team staff will work with District managers and authors to make final decisions on the 2007 report organization. However, any revision to the report's organization does involve trade-offs, particularly because readers of the report are used to the current organization and it is important that major changes in the report's order not be made frequently for the sake of consistency.

Regarding specific comment #1 on page 6, additional terms and units will be added to this year's SFER Executive Summary glossary, as appropriate. Regarding specific comment #2, the SFER Production Team will work with the chapter authors in future Executive Summaries to highlight important challenges facing the District, as appropriate; however, it is not clear at this time what specifics will be added. Regarding specific comment #3 on public outreach, please refer to Response to Comment #3 for Chapter 1A in this appendix.

SFER REVIEW PROCESS AND PUBLIC WORKSHOP

The SFER Production Team joins the panel in wishing to make the SFER Peer-Review and Public Workshop process more efficient and effective. District staff will center their presentations at next year's workshop around the three points provided on page 7 of the panel's Final Report. In addition, staff will modify the panel's Statement of Work for the 2008 SFER to include a review of responses to the previous year's report.

RESPONSES TO COMMENTS ON CHAPTER 1A

Garth Redfield and Stacey Efron

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Comment 1: *As an introductory issue, the panel suggests that some mention should be made of the potential impact on the South Florida Environment of increasing urbanization onto to EAA lands that have been removed from production.*

Response 1: This comment is being addressed with the addition of some narrative in Chapter 4.

Comment 2: *The panel recommends a one or two page general description of the South Florida environment that will orient the reader to the various parts of the system that are being discussed as well as describe their interconnectedness.*

Response 2: In an overall effort by the District to streamline the 2007 SFER where possible, it should be noted that this year's introductory chapter was significantly reduced to about half the total pages than in previous SFERs. This more concise version is intended to provide readers with a brief overview, supplemented by further detail provided in previous consolidated reports and available in the complete Final Report deliverable on CD-ROM and the SFER website (www.sfwmd.gov/sfer/). In the interest of continuing to streamline the SFER, the authors will limit the addition of Chapter 1A to a short narrative providing an overview of the various parts of the system and their interconnectedness (see page 1A-2).

Comment 3: *The panel recommends that the District include a section in Chapter 1A, or perhaps more appropriately, a new chapter, which provides information about the District's many outreach education activities. Although the Executive Summary is, in itself, a high-quality education outreach document, the panel views the general lack of such information within the SFERs as a seriously missed opportunity, considering that the District appears (through brief mention in other chapters) to be engaged in many excellent endeavors to help educate the general citizenry about the environmental and socio-economic issues affecting South Florida. Such a chapter 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.*

Response 3: The District concurs with the panel's recommendation to provide additional SFER-related information as part of the agency's public outreach efforts — an important aspect of the agency's function in providing regional-wide public support. It should be noted that the District's Department of Public Information (DPI) is specifically charged with this vital task of conveying District-related information through various public outreach and education opportunities throughout the agency's 16-county region. There are many sources of public information routinely prepared by the District, such as the quarterly publication of *WaterMatters* newspaper insert, monthly e-newsletters, "Fact Sheets" on key agency topics and issues (e.g.,

Comprehensive Everglades Restoration Plan/Acceler8 and Lake Okeechobee & Estuary Recovery Plan), community outreach programs (e.g., Speakers Bureau), and the District's website (www.sfwmd.gov). Although the two-volume SFER Main Report and its appendices are geared toward the more detailed reader, the District recognizes that a more diverse readership also seeks this information. Therefore, the agency voluntarily produces the annual SFER Executive Summary to complement the statutorily mandated Main Report. It should be noted that the District is also now developing a publication, with key updates and highlights of the 2007 SFER Executive Summary, to further promote and enhance the agency's public outreach efforts. It is currently anticipated that this supplemental information will be produced in 2007. In light of these efforts, it would not be appropriate to add a separate section or chapter on public outreach activities in the SFER. However, the District will provide a brief overview of agency's outreach efforts, as described above, at the 2008 SFER public workshop.

RESPONSES TO COMMENTS ON CHAPTER 1B

Garth Redfield and Stacey Efron with Chapter Co-Authors

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Comment 1: *The panel recommends adding the C-139 basin and data (inputs, outputs) to Figure 4.*

Response 1: As discussed in the *EAA and C-139 Basin Source Control Programs* section, outputs from the C-139 basin are included in the outputs moving south into the Water Conservation Areas (WCAs). To give the reader this impression on the map, the color of C-139 will be adjusted to match the Everglades Agricultural Area (EAA). It should be noted that this figure is intended to be a more high-level overview of total phosphorus (TP) loading across the Everglades Protection Area (EPA) and not individualize basin-specific inputs and outputs. More specific information on the C-139 basin, including TP inputs and outputs, is provided in Chapter 4 of this volume.

Comment 2: *The panel recommends that the District should take the necessary steps to obtain reliable estimates of atmospheric deposition (p.3). It would greatly benefit the District to have a baseline, especially confronting what Chapter 1b describes as dramatic increases in adjacent urbanization.*

Response 2: As presented in Chapter 1B, the District uses estimated TP deposition values and assumptions, while TP concentrations and loads are compared to established baseline values for specific regional areas (i.e., Kissimmee Basin, Lake Okeechobee, and EPA). While the majority of TP loading across South Florida comes directly from atmospheric deposition, substantial uncertainty exists in both the precision and accuracy of determining regional atmospheric deposition rates (Redfield, 2002). The difficulty in obtaining such estimates is compounded by the fact that standard methods of atmospheric monitoring typically only measure a portion of total deposition or are not very reliable. The District recognizes the value in obtaining more reliable deposition values, and the Atmospheric Deposition Program for Mercury, led by the Florida Department of Environmental Protection (FDEP), is currently working to obtain additional data on atmospheric deposition of phosphorus.

Comment 3*: Chapter 1B as recommended in the 2005 review process is also a positive development as it provides a context for the report in terms of cross-cutting issues affecting large parts of the South Florida region.*

Response 3: Comment appreciated.

Comment 4*: The panel recommends that the District redouble its efforts to control TP loads entering Lake Okeechobee by working with appropriate agencies on development policies (BMPs, chemical treatment, sedimentation ponds, etc.) that will contribute to reduced TP loads. More attention in the 2008 SFER should be paid to describing the BMP effectiveness above the Lake. A BMP report similar to the one presented in the past for work in the EAA should be added to any future phosphorus discussion. This is particularly needed since there has not been any substantial reduction in loading of phosphorus into the Lake in the last decade.*

Response 4: Implementation of Best Management Practices (BMPs) in the Lake Okeechobee watershed is a joint effort between multiple agencies, namely the District, FDEP, Florida Department of Agriculture and Consumer Services (FDACS), and the land owners. Furthermore, implementation of local scale and regional public works for the purpose of nutrient reduction is also a joint effort between these same agencies and others, including the U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), U.S. Department of Agriculture (USDA), U.S. Environmental Protection Agency (USEPA), and local governments. Each agency is contributing at an impressive rate and expresses a willingness to do more. Funding and staffing are the limiting factors controlling the scope and rate of implementation.

In general, three types of BMPs are implemented in the Lake Okeechobee watershed: owner-implemented, cost-share, and additional BMPs. The owner-implemented BMPs are mainly operational changes only. Suites of owner-implemented BMPs are land-use specific. For example, cow/calf land uses may reduce phosphorus fertilization, improve grazing management, or have better management of nitrogen and micronutrients. Additionally, the owner-implemented BMPs for urban areas include reductions in phosphorus fertilization and lawn maintenance activities. The FDACS is responsible for the implementation of agricultural BMPs, and the FDEP is responsible for urban BMPs under this category.

Funded cost-share BMPs are BMPs implemented under existing cost-share programs [FDACS (state appropriations) and USDA Natural Resources Conservation Service (federal appropriations)] and reflect BMP implementation efforts primarily within the four priority basins (S-154, S-191, S-65D, and S-65E). These BMPs were selected to represent the maximum contribution that could be implemented within the financial capabilities of the average landowner.

Additional agricultural BMPs reflect the implementation of more aggressive and expensive agricultural BMPs such as edge-of-farm chemical treatment facilities and detention for intensive land uses (e.g., citrus, dairy, ornamental, sod, and row crop). The FDACS and the District will be responsible for implementing this type of BMP.

Currently, the first two types of BMP implementation are ongoing primarily in the four priority basins. BMP implementation in the portion of the Lake Okeechobee watershed south of S-68 (Lake Istokpoga) and S-65 (Lake Kissimmee) including C-44 and L-8 will be completed by 2009. BMP implementation in the Lake Istokpoga and Upper Kissimmee basins will commence in 2009. Implementation in the Lake Istokpoga watershed will be completed by 2012. Implementation in the Upper Kissimmee Basin will be completed by 2015. The additional agricultural BMP implementation will commence in 2010 for all basins and will be completed by 2015.

Comment 5*: The panel recommends that chapter 1B in the next SFER duplicates this effort by focusing on sulfur and mercury.*

Response 5: At this time, it is not clear if there is sufficient information available on sulfur and mercury to provide an overview similar to this year's Chapter 1B. This suggestion will be discussed at the project kick-off meeting for the development of the 2008 SFER, scheduled in spring 2007.

Comment 6*: Given the importance of phosphorus loading from the Kissimmee River and areas north of the Lake, the panel recommends that current phosphorus management strategies that are only in the early planning stages be accelerated. Concerted efforts should be made to advance a BMP implementation that presently is not expected to commence until 2009 (and be completed by 2015) should be drastically advanced.*

Response 6: Given the vastness of the 3.5+-million-acre Kissimmee watershed, there are significant funding and manpower limitations to accelerate the implementation of BMPs north of Lake Kissimmee. Increases in the amount of effort or the rate of implementation are unlikely without substantially increased funding. New and increased funding from the Florida legislature and SFWMD for Lake Okeechobee and Estuary Recovery (LOER) related efforts are already accounted for in schedules and activities cited in this report.

In addition, because the intervening lakes "mask" the effects of both loading and BMPs, no noticeable reductions are anticipated to occur in Lake Okeechobee as a result of BMP implementation in the Upper Basin. However, such efforts are expected to improve conditions in the Upper Kissimmee Chain of Lakes. Further information on this status is expected to be reported in the 2008 SFER.

Comment 7: *While the focus of the SFERs has been heavily on phosphorus, nitrogen is an important nutrient within the system as well, particularly in the coastal environments where nitrogen is normally limiting. Releases of nitrogen to the various estuaries on the Gulf and Atlantic coasts necessitate paying attention to the sources and processes affecting nitrogen concentrations in those releases.*

Response 7: The District's Coastal Ecosystem Division (CED) has initiated a two-year project to examine nutrient limitation of phytoplankton growth in the Caloosahatchee Estuary. This project is intended to determine which nutrient (nitrogen and phosphorus) can become limiting, the concentration at which either nutrient becomes limiting, and the ability of organic nitrogen to support phytoplankton production (see Chapter 12 of this volume). A similar project will be initiated in the St. Lucie Estuary in Fiscal Year 2007 (FY2007). These two projects will allow for a comparison of limiting nutrient between the two estuaries under varying seasonal inflow and loading conditions. In addition to these two projects, nitrogen data are collected in the Loxahatchee River and Estuary through a cooperative agreement with the Loxahatchee River District (LRD). CED staff is working with the LRD to increase the data collection to monthly in response to comments by the SFER panel. It is anticipated that additional information on these projects will be presented in the 2008 SFER.

LITERATURE CITED

Redfield, G. 2002. Atmospheric Deposition Phosphorus: Concepts, Constraints and Published Depostion Rates for Ecosytem Management. SFWMD (EMA) Report No. 403. South Florida Water Management District, West Palm Beach, FL.

RESPONSES TO COMMENTS ON CHAPTER 2

Wossenu Abtew

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS ON THE CHAPTER

Thank you for the positive comments on the readability and informative overview of the hydrology chapter. The authors agree that the placement of Chapter 2 near the beginning of the South Florida Environmental Report provides the reader with a solid understanding of the District's hydrology, water management goals, operations and meeting objectives.

Comments:

1. *While the content of Chapter 2 is excellent, organization of the material needs attention. The subtitles, and content under each subtitle, do not always capture what the reader expects to be presented, and the chapter does not provide the information in a logical sequence. The structure (template) for Chapter 2 should be carefully reviewed in the production of the 2008 report.*

Response: The outline of the chapter has been changed as suggested and the recommended format will be used in the 2008 SFER. The current 2007 SFER has been revised according to the new outline format, which is shown below.

The following is the revised format for Water Year 2007. For next year, sections that do not change year to year will be moved into an appendix.

A. Summary
B. Introduction
    i. The South Florida Regional Water Management System: A Regional overview
    ii. Hydrologic Variation in South Florida
        1. Hydrologic Variation Indicators
        2. Water Management and Hydrologic Variation
    iii. Water Management
        1. Purpose of Water Management
        2. Use of Regulation Schedules for Water Management
        3. Elements of Water Management
        4. Operation of Water Control Structures
        5. Tools Used for Operations and Water Management
        6. Use of Data and Decision Making for Operations
        7. Management and Operations of Lake Okeechobee Water Levels

iv. Stage-Storage Relationships of Lakes and Impoundments and Nominal Hydraulic Residence Time

C. Emerging Topics
   i. Long-Term Climatic Variability
   ii. South Florida Hydrologic Monitoring System

D. The 2005 Hurricane Season in South Florida
   i. Hurricane Dennis
   ii. Hurricane Katrina
   iii. Hurricane Rita
   iv. Hurricane Wilma

E. Water Year 2006 Hydrology
   i. Rainfall and Evapotranspiration
   ii. Water Levels, Flows and Water Management
      1. Upper Kissimmee Chain of Lakes
         a) Lake Alligator
         b) Lakes Joel, Myrtle, and Preston
         c) Lakes Hart and Mary Jane
         d) East Lake Tohopekaliga
         e) Lake Tohopekaliga
         f) Lakes Kissimmee, Hatchineha, and Cypress
      2. The Lower Kissimmee System
         a) Pool A
         b) Pool BC
         c) Pool D
         d) Pool E
         e) Lake Istokpoga
         f) Lake Okeechobee
      3. Upper East Coast and the St. Lucie Canal and Estuary
      4. The Caloosahatchee Canal and Estuary
      5. The Everglades Agricultural Area
      6. The Everglades Protection Area
         a) Water Conservation Area 1
         b) Water Conservation Area 2
         c) Water Conservation Area 3
         d) Everglades National Park
   iii. The Lower East Coast

F. Conclusion

G. Literature Cited

The adequacy of full hydrologic reporting on Everglades National Park (ENP) will be evaluated and addressed in coming water year report.

2. *There is a need to assure the reader, in the documentation of the hydrometeorologic network, that periodic changes in the network are not causing inconsistencies in data quality and/or resulting information? One way to help insure that changes in the measured hydrology are the result of changes in the hydrology, and not changes in the network, is to document such changes so that analysts are not comparing data that actually are comparable. Perhaps tags could be placed in DBHYDRO to note equipment changes so analysts can correlate past data with current data to account for changes in the network design and operations.*

Response: The method for documentation has been created for certain hydrometeorologic parameters. For this given parameter, a new DBKEY is created when upgraded equipment (sensor and/or communication system) is installed at the same sampling station. In order to apply this method in DBHYDRO for all the parameters, some changes to the configuration of the Oracle tables would require modification. When an in-situ equipment (e.g., a permanently installed device) is changed, the current procedure is to record such a change in the Site Maintenance Worksheet (a Microsoft Access-based database that is separate from the DBHYDRO).

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS – APPENDIX 2-2[1]

Refer to the relevant section in Part II of this appendix, *Responses to Comments on Special Review Topics.*

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS – APPENDIX 2-4

Chandra Pathak

The South Florida Hydrologic Monitoring System appendix will be presented as a special topic in the 2008 SFER Peer Review and Public Workshop. The current draft document will be revised and undergo internal review and will be published internally. The peer review comments will be addressed as much as possible. The following are peer review panel comments on Appendix 2-4 and respective response by appendix authors.

Comment: *Appendix 2.4 contains documentation of the current water quantity measurement system. The Appendix does not indicate what equipment was used in the past, only what is being used now. Thus it is not possible to check if changes in sampling equipment resulted in changes in the data. The Appendix does document current monitoring networks, equipment, and operations well. Is it possible to know what equipment was used in past measurements?*

Response: Yes. However, this information is recorded in various separate databases, including DBHYDRO. For example, for field flow measurements that are used to calibrate flow computation equations, the instrument used to collect the data is recorded in the QMEAS database (a subset of the DBHYDRO database).

[1] Draft Appendix 2-2 has been modified as Appendix 2-3 in the final 2007 SFER.

Comment: *Is it possible to note equipment changes in the DBHYDRO database?*

Response: Yes. (Refer to the above response to comment #2 for Chapter 2.)

Comment: *On page 59 there is an indication that the longest consistent measurement record is from 1995 to 2005. If a longer analysis is needed, is it possible. to correlate past data with current data to account for differences in measurement technology so that the data are comparable over 20 or 30 years? This is a critical question to the soundness of long-term trend, or even year-to-year, assessments of lake levels and flow.*

Response: Over longer periods of time (e.g., 20 to 30 years in range), different technologies were used to measure the same parameter. Improved technology, when implemented properly, has resulted in the improved quality of the data (thereby creating a lower uncertainty in the data). Essentially, the error band in the measurements is reduced. This reduction in the error band does not necessarily translate in the need to adjust the data.

Comment: *Given that several of the networks are under going evaluation, how will future sampling locations be 'optimized' (the word used in the report)? What criteria will be used to determine sampling locations?*

Response: Criteria for determining optimal sampling locations would vary with the hydrologic parameter under consideration. For example, the criteria used for choosing a rain gauge location would be different than that used for locating flow sites. Further details on these subjects are provided in documents related on the rain-gauge network optimization study and the flow and stage network optimization studies.

Comment: *In the current monitoring design studies, is the need for long-term consistent and comparable data and information being considered? For example, will a subset of sampling sites being denoted long-term sampling sites where the emphasis of sampling is on consistency over long periods of time?*

Response: The response to this question depends on what is meant by "consistent data." If the definition is to mean measuring the same parameter with different technologies and different methodologies at different time periods, then the answer is "yes." If the definition is to mean measuring the same parameter with the same technologies and same methodologies at different time periods, then the answer is "no."

In the case of flow data, consistency is dependent upon the consistency of the measured static (geometry) and dynamic (stage) data, and stream gauging data used for flow-rating equation(s) validation, calibration, and verification. In this sense, the flow-ratings equations are constantly being improved because of decreased uncertainty in the stream gauged data from the field and better physical representation of the flow dynamics via the new and improved flow rating approaches.

Comment: *There are a number of indications that the networks are constantly changing. How does such constant change impact the ability of the District to examine long-term hydrological trends in a scientifically sound manner, such as those associated with climate change? On page 40, there is a discussion about the loss of data due to equipment malfunction. Is it possible to estimate the percentage of data lost to equipment malfunction?*

Response: It is possible to estimate the percent of the missing data due to equipment malfunction that includes sensor malfunction and malfunction of data communication (or data transmission) system (such as CR10, RACU, MOSCAD, LoggerNet). For example, during 2005, approximately 3.2 percent daily mean flow data were missing, whereas approximately 4.2 percent daily rainfall data were missing due to malfunction of equipment that includes both sensor and communication systems. The table below provides the percent missing data for daily mean flow and daily rainfall from 2001 through 2005.

Table : Percent Missing Data Due to Equipment Malfunction

	Percent Missing Data				
	2001	**2002**	**2003**	**2004**	**2005**
Mean Daily Flow	2.61	2.59	2.41	3.04	3.22
Daily Rainfall	4.51	4.27	4.79	4.53	4.24

RESPONSES TO COMMENTS ON CHAPTER 3A

Kenneth Weaver[2], Grover Payne[2]
and Shi Xue

RESPONSES TO PEER REVIEW PANEL COMMENTS

Comment: *As was discussed in the 2006 review, the routine nature of the reporting contained in this chapter begs the question of streamlining the reporting. Instead of simply calling up the electronic text of the previous year's chapter and converting data from WY2005 to WY2006, it appears that this chapter could use a complete redesign to condense its findings. This type of streamlining, as was described in Chapter 1A, was to be included in this report, but there has been no change in Chapter 3A. Why not?*

Response: The chapter was in fact streamlined from previous iterations. Much of the background material was removed and now is referenced from previous reports. The authors believe that Chapter 3A (previously 2A) has always been a relatively, compared to other chapters, streamlined and succinct chapter. The major results are summarized in just two tables, which are followed by more detailed but still brief discussions. The authors will, however, investigate additional streamlining to present the findings in future reports, provided that the streamlined presentations still achieve the objectives of the chapter and requirements of the Everglades Forever Act (EFA).

Comment: *Lines 43-46, on page 3A-2, notes increases in WY2006 conductivity. The WY2006 excursion frequency was noted as being significantly greater than the WY 1978-WY2004 historical period of 10.3. In checking the 2006 SFER for the historical period, the WY 1978-WY2003 excursion frequency is 15.8. It seems unlikely that adding one year to the historical period would decrease the excursion frequency by 35%. How meaningful is the historical period, since it changes each year and is not a constant baseline for comparison purposes?*

Response: The Water Year 2006 (WY2006) excursion frequency (21.0 ± 3.9 percent) for specific conductance in the Water Conservation Area 2 (WCA-2) interior was significantly greater than both WY2005 (7.5 ± 2.8 percent) and the WY1978–WY2004 historical period (10.3 ± 0.8 percent). The WY1978–WY2003 excursion frequency for the WCA-2 interior was 9.8 ± 0.8 percent, based on the data used for the 2006 SFER. The differences between the WY1978–WY2003 and WY1978–WY2004 periods are minor and not statistically significant. The WY1978–WY2003 excursion frequency of 15.8 ± 1.4 percent, referenced by the reviewer, was actually for WCA-2 inflows and not the interior. There is no inconsistency between the two reports.

Comment: *In comparing the number of sampling sites in the Everglades National Park (Figure 3A-1 of the draft 2007 report) with the corresponding number of sampling sites in the Everglades*

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

National Park (Figure 2A-1 in the draft 2006 report), there are 11 stations included in the analysis for 2007 and 13 (perhaps 14 as the plot appears to have two sites very close together) included in the analysis for 2006. How can the results for 2006 be comparable to the results for 2007 if the number of sampling sites included in the analysis is not the same? This observation, again, points out a consistency problem in the "found" data strategy used to support the water quality assessments in Chapter 3A and 3C. While there are standard protocols to analyze the data, the database contains data that were not collected (or even organized) for the purpose of evaluating standard compliance. Thus, the database, when searched for data meeting a given set of criteria, will select different stations to include in different years (due to a large number of factors over which the data analysts have no control). This situation is the result of using "found" data to conduct water quality standard compliance assessments – the database can change from year-to-year through no fault of those doing the assessment. The panel has pointed out this issue before and it needs attention. The 2007 report contains many examples of inconsistencies between the 2006 and 2007 reports due to using "found" data to conduct water quality assessments.

Response: The comments reflect a misunderstanding regarding the analyses conducted each year. Water quality data are queried each year from DBHYDRO from a consistent set of stations. Only data from the most recent two water years (e.g., 2005 and 2006) are queried from the database and only new (more recent) data are appended to the dataset used in the Chapter 3A analyses. A consistent set of stations was selected from well established long-term projects. The consistent set of stations was selected to ensure the type of evaluation consistency the panel is suggesting. However, changes were implemented in this report in an attempt to move toward implementation of a standard network for water quality standards compliance evaluations in the EPA. The monitoring stations were revised for WY2006 to reflect the expected phosphorus criterion networks. Full implementation of the standard network will help ensure a consistent dataset upon which to base water quality standards compliance evaluations for the foreseeable future. The reason for the differences noted between this years report and the 2006 report is that the stations used for all periods in this report were updated to the "standard network" to assure consistency between periods in this report.

Comment: *In line 392 there is reference to observed change in alkalinity excursions most likely being the result of added sample sites. This is another example of an information problem resulting from the use of "found" data to perform standard compliance assessments over time and then trying to explain detected changes. Is the change due to a change in water quality or a change in the monitoring system (i.e., added sites in this case).*

Response: The change is most likely related to changes in the monitoring network. Additional stations were added in areas of higher alkalinity (i.e., nearer to the rim canal), which resulted in a reduction in the excursion frequency (i.e., fewer values less than 20 mg/L). The authors disagree with the assertion that this is a problem resulting from the use of "found" data. The new stations were specifically added to the network to provide improved spatial coverage in area of known water quality gradients. The revised network provides a more accurate representation of water quality conditions within the Arthur R. Marshall Loxahatchee National Wildlife Refuge (also referred to as Refuge) than did the previous network.

Comment: *In Table 3A-3 for inflow to the Refuge, the 1978-2004 timeline uses 134 samples to assess DO standard compliance. For 2005 and 2006 the sample numbers are 5 and 4, respectively. Is it meaningful to compare the percent excursions from the 1978-2004 period with*

that of 2005 and 2006, since different methods were used to compute the findings AND the number of samples is so different?

Response: The authors agree. There is too large a disparity in sample sizes to allow meaningful comparison. A caveat will be added to the final report. The difference in sample sizes is related to the fact that the Everglades' dissolved oxygen (DO) site-specific alternative criterion (SSAC) is assessed as a station annual average. In this case, a sample actually represents an annual average for a site.

Comment: *In Table 3A-4 of the 2007 report, in the Refuge inflow row for 1978-2004, 59 samples are shown to be included in the sulfate concentration computations. In the corresponding table in the 2006 report, Table 2A-4, 836 samples are shown to be included in the sulfate concentration computations for 1978-2003. This is a huge difference in the number of samples — why? The mean in the 2006 report is 58 mg/L while it is 42 mg/L in the 2007 report. Given that 'found' data are being used for the assessment, again, either the data selection criteria changed and/or the database changed. In either case, the numbers do not indicate consistency in the analysis from year to year. Similar sample size differences exist elsewhere in the table.*

Response: There were errors in the originally posted version of Table 3A-4. Data columns were inserted into the table in an incorrect order. The error was corrected and the chapter was reposted on September 16, 2006.

Comment: *Why did the time period for reporting pesticide detection in Table 3A-5 change in the 2007 report, from December 2004 to February 2006, when the time period for pesticide detection reporting in the 2006 report, in Table 2A-5, was October 2003 to December 2004?*

Response: The pesticide monitoring program is conducted on an approximate quarterly basis. However, because the laboratory analysis of samples is time consuming, a complete dataset for the previous water year is not typically available at the time the report is prepared. Therefore, the authors have adopted the convention of updating the report each year with the available data. The period evaluated for the 2007 report was February 2005 through February 2006. Typographical errors have been corrected in the final chapter to reflect this fact.

Comment: *Table 3A-7 reports TP concentrations and loads associated with non-ECP basins. Why does the table use both English and metric units? Given the mixed units, concern develops as to how the loads were computed.*

Response: English units (acre-ft) are routinely used for flow and metric units (kg or metric tons) are routinely used for load throughout the SFER. The loads were computed using appropriate conversion factors.

Comment: *Is there a standard protocol for data analysis for the non-ECP basins or is this a judgment call on the part of the analyst each year?*

Response: A standard protocol for data analysis for non-Everglades Construction Project (non-ECP) is included in Appendices 3A-4 through 3A-4e for non-ECP permit compliance report. Data analysis methods were selected to be consistent with and fulfill conditions of FDEP-issued permits.

Comment: *Alkalinity levels may vary diurnally in areas of high productivity caused by the uptake of carbon dioxide during photosynthesis. This phenomenon could account for the excursions of alkalinity below 20 mg/L. Water sources with different alkalinities can of course also account for the low alkalinity levels, but the excursions noticed in the interior of the Refuge (Table 3A-2) are more likely from diurnal variations. It is suggested that diurnal measurements of alkalinity be made at several located in the Refuge to document this phenomenon if it is occurring.*

Response: While the authors agree that the phenomenon discussed by the reviewer is likely occurring within the more pristine areas of the Refuge and would be an interesting research topic, they do not believe it has significant relevance to standards compliance. The current Class III criterion for alkalinity is $\geq$ 20 mg/L, is implemented based on point measurements, and does not take into account temporal fluctuations. Revision of the alkalinity standard for the Refuge may be appropriate given the naturally low levels. However, it is highly unlikely that a revised standard would include a diurnal evaluation given the difficulty/impracticality in collecting continuous alkalinity measurements through the entire diel cycle.

Comment: *The panel emphasizes that there is a major concern about the consistency of the data employed in producing the two reports? The annual scan of DBHYDRO to obtain data to support standard compliance assessments results in different data records being used from year-to-year. This fact raises concern about the consistency of the standard compliance conclusions included in the South Florida Environmental Report.*

Response: The authors strongly agree with the panel regarding the concepts of consistency and careful use of "found" data. Extraordinary efforts have been made in Chapters 3A and 3C to ensure consistency of data and analysis methods across reporting years. These efforts include careful and thorough documentation of data sources, data handling, and methods. In the authors' experience, these efforts far exceed those typically applied to ambient water quality assessments, e.g., 303(d) listing, 305(b) reporting, total maximum daily load (TMDL) development. The annual queries of the DBHYDRO database do not result in different records from year to year. Great care is taken by the authors to ensure that this is the case. If for some reason there is a difference, such as refinement of the monitoring network, it is noted as are potential effects on the evaluation.

Comment: *Given the maturation of the procedures employed to conduct water quality standard compliance assessments, it appears that now is a good time to expand the role of Chapter 3 to include water quality descriptions for all of South Florida along with a condensed section of the standard compliance assessment findings. This would permit the Chapter to place extreme water quality events in a larger context, in much the same way Chapters 2 provides an overview of South Florida's hydrology and Chapters 1B and 3C provide overviews of phosphorus. In addition, a section(s) of the revised chapter could be devoted to presenting standard violation results (i.e., water quality extreme events).*

Response: The FDEP and the District will consider this recommendation for future reports. However, it should be noted that water quality analyses conducted for the various areas of South Florida are conducted for different purposes and to satisfy different regulatory mandates. The analyses presented in Chapter 3A were developed to fulfill a requirement of the EFA that "the report shall identify water quality parameters, in addition to phosphorus, which exceed state water quality standards or are causing or contributing to adverse impacts in the Everglades Protection Area." The mandate to perform similar analyses elsewhere in the state, including South Florida, is

given to the FDEP's TMDL program and is implemented pursuant to the state's Impaired Waters Rule [IWR, Chapter 62-303, Florida Administrative Code (F.A.C.)].

Comment: *In seeking more consistency in the data employed for standard compliance from year-to-year, the panel recommends use of a subset of sampling sites that can consistently serve as the basis for standard compliance assessments. For these sites extra effort should be devoted to obtaining the number of samples needed to conduct the assessment. A 'network' of these sampling sites should be identified, documented, and consistently employed to perform the water quality criteria assessments – sites that have 'information' reasons for being included and for which the sample size will be consistent each year.*

Response: The authors agree. The Everglades monitoring program has been remarkably consistent since WY1995. Additionally, efforts are currently under way to establish and document a permanent network of ambient monitoring stations. The full implementation of the network and subsequent acquisition of data will take several years. During the interim, some year-to-year inconsistencies may be noted in the sample sites and sizes. These potential inconsistencies are a consequence of the refinement of the network to better reflect ambient conditions across the entire EPA. It should be stressed that the development of this network is rather unique and remarkable, given that fact that assessments of ambient water quality standards attainment overwhelming rely on "found" data rather than established networks.

RESPONSES TO COMMENTS ON CHAPTER 3B

Donald M. Axelrad[3]

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment: *Different water quality constituents are being addressed in Chapters 3A, 3B and 3C. Each section employs a different template in presenting findings. Given the history of working with phosphorus and testing a variety of approaches for its assessment and presentation in Chapter 3C, is there a possibility that the current effort to delve further into sulfate and mercury (in Chapter 3B) could be informed by the previous experiences with phosphorus? In communicating complex water quality findings to the public and policy makers, consistency breeds confidence. Thus, maintaining a consistent assessment and presentation format, where feasible, across key water quality constituents will greatly facilitate communication. For example, can the methods employed to develop Figure 1B-1 be used to develop a similar figure for sulfate and mercury?*

Response: The primary purpose of Chapter 3A (Status of Water Quality) is to provide an assessment of water quality constituents exceeding water quality standards in the EPA. The primary purpose of Chapter 3C (Status of Phosphorus and Nitrogen) is to provide an overview of temporal and spatial patterns of nitrogen and phosphorus concentrations, to evaluate phosphorus compliance with the 10 parts per billion (ppb) standard, and to assess phosphorus load to the EPA.

Chapter 3B (Mercury Monitoring, Research and Environmental Assessment) has elements in common with chapters 3A and 3C. However, there are differences in knowledge of mercury and sulfur as compared to many other water quality constituents that make it difficult to write the mercury chapter in the same form as that for the other two water quality chapters.

These include: it is appropriate to track temporal and spatial patterns of mercury in bioindicators rather than in water; there is a need to report on research directed at developing water quality standards for mercury with respect to protection of fish-eating birds, as realistic standards do not exist; the existing water quality standard for mercury with respect to human health and fish consumption is not relevant (12 ppt total mercury in fresh water); there are no water quality standards for sulfate or sulfide; the sources for sulfate to the EPA are as of yet not well quantified; the sources of mercury to the EPA are dominantly atmospheric (>95 percent); there is a need to report on actual and planned improvements to the E-MCM model as this may reveal best options for future mercury management; and it is relevant to research mercury and sulfur (and iron) biogeochemistry as sulfate loading reduction may prove to be the best option to reduce mercury levels in Everglades fish.

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However, as there are elements of similarity between chapters 3A, 3B, and 3C, and as all are authored by FDEP staff, the authors will discuss options for achieving greater uniformity of chapter presentation for future SFERs.

Regarding Figure 1B-1, Summary of total phosphorus (TP) loading across the Kissimmee-Okeechobee-Everglades region, and developing a similar figure for sulfate and mercury, the data for sulfate loading are as of yet not well quantified, and as for mercury, 95–98 percent of loading to the EPA is from atmospheric sources. Agreed; when good sulfate loading data are available, and when the FDEP has measures of local-versus-global and wet-versus-dry deposition mercury, then employing a figure similar to Figure 1B-1 would be very useful.

There may be reasons for aspects of Chapter 3A to have a presentation format more like that of Chapter 3B. In particular, as regards conductivity, it appears that the current state water quality criteria for Class III freshwaters, which allow for a 50 percent increase in the specific conductance or 1,275 micromhos per centimeter (μmhos/cm), whichever is greater, may not be protective of areas of WCAs 1 and 2 and Big Cypress; this is supported by Gottlieb (Andrew Gottlieb, PBSJ, pers. comm. 2006; Gottlieb et al., 2006), and Sklar (Sklar et al., 2006).

Development of an appropriate water quality criterion for protection of periphyton and other biota, and estimates of conductivity (major ion) loading to the EPA, could be beneficial for protecting the ecosystem.

An example of the benefits of the approach as per Chapter 3B for some water quality constituents is provided by sulfate. Aspects of data presentation as per Chapter 3B are necessary to elaborate on data presented in Chapter 3A for sulfate. In this case, Chapter 3A summarizes sulfate concentrations in the EPA and indicates spatial and temporal trends. (There are no surface water criteria for sulfate, so frequency of excursions from water quality criteria cannot be assessed.) Chapter 3B additionally attempts to identify major sulfate sources to the EPA and to document sulfate effects (mercury methylation, phosphate release from sediments, and sulfide toxicity).

Comment: *The panel suggests converting Chapter 3 into a broad, integrated, overview of water quality conditions in South Florida with a section that then summarizes where standards were not met (not unlike the overview nature of Chapter 2 and 3C). The standard violation section could make use of graphics to convey legal reporting compliance with standards in a manner similar to that in Chapter 2 where success in meeting regulation schedules is graphically portrayed (e.g., Figures 2-37 and 2-39).*

Response: Agreed, there is merit in converting Chapter 3 into an integrated overview of water quality conditions, but for reasons as discussed above — e.g., lack of relevant water quality criteria for mercury and sulfur — full integration is not yet possible.

Comment: *The exceedingly high levels of mercury in large mouth bass in some locations require further understanding, particularly the levels in Everglades National Park. The rapid declines, followed by increases, do not seem to track the increases in water to the region; and this relationship should be further explored.*

Response: Agreed. The FDEP is optimistic that the U.S. Geological Survey (USGS) will investigate this issue.

Comment: *The role of sulfur in phosphorus releases should be integrated into the modeling efforts for the Everglades.*

Response: Agreed, but importantly, it should be noted that the FDEP currently does not have modeling capabilities for this type of effort. However, the FDEP can coordinate with the District and its modeling staff to prepare supporting documentation, as appropriate.

Comment: *The report states that, without sulfate, the mercury problem would not exist, a statement that requires further explanation and justification, and is not fully justified in Appendix 3B-3.*

Response: Agreed. The statement will be modified.

Comment: *While the sulfate problem has been identified, there is still controversy about the sources, which must be resolved as a key management goal. Whether the sulfate comes from agricultural use, from soil subsidence, and/or from Lake Okeechobee is critical to both understanding biogeochemical cycles and to management and restoration. Several different hypotheses for the source of the sulfur should be examined, not just agricultural amendments.*

Response: Agreed. Funding is being pursued to develop a sulfur mass balance.

Comment: *Further, the possible effect of sulfur on sawgrass, by favoring the replacement by cattails, is an important finding that requires extensive study.*

Response: Agreed. Funding is being sought for this research.

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS ON THE CHAPTER

Comment 1: *The panel recommends adding a reference to the bullet items in the overall summary so that readers can find a more complete analysis of each item.*

Response 1: Agreed.

Comment 2: *The District should examine the possible effects of changing from 2 to 18 medical waste incinerators.*

Response 2: Data on numbers of medical waste incinerators are being reviewed; it appears the previous statement is incorrect. There is a need for an update of the current mercury emissions inventory. The chapter text will be revised accordingly to reflect this information. It is anticipated that further updates will be provided in future SFERs.

Comment 3: *The District should strengthen understanding as to why mercury levels are high, and continue to increase, in the ENP.*

Response 3: Agreed. The FDEP along with its collaborating agencies, including the USGS and the District, will continue to work together to address this issue. It is anticipated that further updates will be presented in future SFERs.

Comment 4: *The District should obtain a mass balance for sulfur in the Everglades.*

Response 4: Agreed. As noted above, funding is currently being pursued to develop a sulfur mass balance.

Comment 5: *Extensive study should be undertaken to examine the possible effect of sulfur on sawgrass, allowing replacement by cattails, including continuation of the experiments on the relative effects of sulfate on plant growth.*

Response 5: Agreed. Funding is being sought for this research.

Comment 6: *The new SAMS site should be within the ENP since it is critical to begin to understanding mercury dynamics within the ENP.*

Response 6: Agreed. This recommendation will be examined in the context of the need for SAMS sites for statewide mercury TMDLs.

Comment 7: *The wet deposition of mercury studies are extremely important and should be continued, especially since they seem to be indicating a disturbing increase in wet mercury deposition.*

Response 7: Agreed. The FDEP plans to continue these measurements.

Comment 8: *The sulfur studies should be continued in terms of both sources and effects. This effort should include a detailed analysis of the sources of sulfate from the EAA, and clarification of whether the sulfate comes from the EAA amendments (delineating current from legacy uses), or from Lake Okeechobee.*

Response 8: Agreed. This is a matter of high priority.

LITERATURE CITED

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Sklar, F.H. et al. 2006. Chapter 6: Ecology of the Everglades Protection Area. Redfield, G., ed. In: *2005 South Florida Environmental Report*, South Florida Water Management District, West Palm Beach, FL. Pp. 6-14 – 6-24. Online at http://www.sfwmd.gov/sfer/SFER_2005/2005/volume1/chapters/V1_Ch6.pdf, November 7, 2006.

RESPONSES TO COMMENTS ON CHAPTER 3C

Grover Payne and Kenneth Weaver

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment: *When comparing Table 2C-1 of the 2006 report with Table 3C-1 in the 2007 report (as well as Tables 2C-2 with 3C-2), and examining WY2005 results, which appears in all tables, questions as to consistency of data analysis and reporting arise. Why are the WY2005 data different in the two tables (i.e., the number of samples employed in the analyses are different in all cases, which in turn results, in some cases, in the geometric means being different and the max/min being different). Are the data for analysis selected each year using new QA/QC criteria? If the data included in the analysis can vary from year-to-year, how can consistent and comparable results be obtained over time and space?*

Response: The main reason that the data are different in the two tables is that during this year's analysis, an effort was made to adjust the monitoring sites used to be consistent with the expected phosphorus criterion monitoring network. This monitoring network will be used as a consistent basis for both the annual phosphorus criterion evaluations and the general ambient water quality assessments. In establishing this consistent basis for future evaluations, changes had to be made in the group of stations used in the previous report. To make the temporal comparisons in this year's report more useful, data from the revised network were used in the analyses of all three assessment periods, which resulted in the differences observed. In addition to the transition to the more consistent monitoring network, there may have been a small amount of WY2005 data unavailable for the SFER 2006 report preparation that was subsequently added to the database. No changes have been made to the quality assurance/quality control (QA/QC) screening method in several years. To help ensure that the temporal comparisons are appropriate, each report provides the current data for all three time periods using the same set of monitoring sites, with the data from these sites being selected and screened in the same manner for each period.

Comment: *Statistics of the 1978-2004 timeline, against which annual comparisons are made, also change from year to year as the record lengthens. What, then, is the purpose of the 'historical' period comparisons? Would it not be more meaningful to put the WY1979–WY1988 baseline period concentrations in Table 3C-1? Are the WY1979–WY1988 sample size and statistics are constant over time, or are they recomputed each year after another search of DBHYDRO? The absence of a firm, constant, baseline, in Table 3C-1 (and similar Tables) make it difficult to discern trends in TP concentration over the years. In other words, the WY979 - WY1988 period statistics are trending either up or down as the annual geometric means are trending up or down. Figure 3C-1 is designed to help the reader understand how the TP concentrations are changing over time, thus it is not clear why the base line period is changed every year. The panel realizes that there is a section comparing TP loads across structures, but there is no table or figure comparing TP loads across years. Why not?*

Response: The historic period (1978–2004) is not intended to be a baseline period. Instead it just represents the period of record minus the two most recent years. Also, as stated in the comment, Figure 3C-1 does provide annual data over the period of record so that the reader can clearly see

any trends over time. The use of a fixed baseline period will be considered in future reports as well as a table providing loading data across years.

Comment: *In attempting to explain high TP readings in the dataset, there is reference to potential problems with the sampling methodology. For examples, on page 3C-14, lines 385-386, the following statement is made: "As noted, this unusually high measurement was made during a low water period and may not be representative of ambient conditions." The same type of statement is made in lines 638-640. The implication of the above statements is that staff collecting the samples are not guided in how to measure low water conditions in a manner such that the samples are representative of prevailing conditions. Given the guidance in the Field Sampling Quality Manual, how can this occur? If a representative sample cannot be obtained, how is this fact reflected in DBHYDRO? Is there a qualifier that could highlight, with certainty, the problem with the sample, rather than speculating about a possible problem with the monitoring system?*

Response: Such general conclusions cannot be drawn from the mention of a potential problem with two (2) samples out of the thousands collected in the EPA each year. The Everglades marsh is one of the most difficult environments to collect good representative samples. The samplers are trained and have guidance regarding the collection of water quality samples in this difficult environment and typically do an excellent job of collecting representative samples, however, errors do occur. The difficulty in collecting representative samples is further exacerbated under low water levels and is why samples are not collected when water levels are below 10 cm. If the sampler suspects that a sample is not representative of ambient conditions, the sample is discarded and recollected. If the problem with the sample is found after it is analyzed, the results are flagged with the appropriate QA/QC qualifier in DBHYDRO. Since no problems were noted by the samplers or the laboratory in this case, the questionable values were not qualified.

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

Response: There seems to be a general misconception concerning the monitoring being conducted within the EPA. The monitoring is not conducted at random sites or at irregular frequencies as implied in the comment. For example, the monitoring in the marsh typically is conducted at a fixed set of sites on a monthly basis and the only change in the number of samples occurs when conditions prevent sampling (e.g., marsh dry-out). As stated previously, the change in monitoring networks in this year's report represents a move toward a more consistent network for future assessments as desired by the reviewers and is why the analyses for the previous years were updated to reflect the data for the same set of sites as the current monitoring year. Also, only a small portion of the data (typically 2–3 percent of the data) is excluded as the result of the QA/QC screening so this is not a large source of variability. The authors disagree with the

conclusion that the comparisons made are inaccurate. It is much more likely that the concentration differences observed reflect the climatic extremes that occur and result in the observed differences in the number of samples collected.

Comment: *On page C-14, last paragraph, there is a discussion of the 'abnormal' conditions of WY2005 increasing TP concentrations and how the data for WY2006 indicates that TP concentrations have returned to normal. As another line of evidence, the TP loadings from the basins should reflect a similar 'return' to normal. By examining the TP loadings in the 2006 report and comparing them to those in the 2007 report (in Table 3C-3), the trends indicates that 'From WCA1' the loadings were considerably less than 2005, but the 'From WCA2' indicates more loading in 2006. It is not clear that the loadings confirm the conclusions stated on page C-14. However, it should be pointed out that a sufficient time series of the loadings is not available in the report to enable evaluation of 'normal' TP loading relative to the discussion on page C-14. Is a time series of TP loadings (plot or bar chart) at key structures relevant to the purposes of Chapter 3C?*

Response: Yes, the trends indicate that "From WCA1" the loadings were considerably less than 2005 due to less flow in WY2006 than in WY2005, but the "From WCA2" indicates more loading in WY2006 than WY2005 due to higher flow in WY2006. There was a map showing the TP loadings to different parts of the EPA provided in the SFER a few years ago but it was removed due to the many issues related to developing this kind of map. The authors will consider the feasibility of presenting this kind of map.

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

Response: It was based on weekly sampling of five stations. This is an estimated value and there are many data issues as presented to the Technical Oversight Committee (TOC); therefore, the authors can only use the reported value in the publication.

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

Response: The assumption by the reviewers that a large portion of the total nitrogen (TN) data is lost in the data screening process is incorrect. The simple reason for the lower number of samples for TN is that samples for TN are collected less frequently than TP at inflow and outflow structures. The arithmetic mean is provided as a measure of the central tendency of the data, as is the median, which is provided for both TN and TP.

Comment: *Presentation of the phosphorus criterion rule compliance could benefit from a graphic summary of the data/findings from Appendix 3C-3 placed in the body of the text in Chapter 3C. Currently, there is only a brief discussion.*

Response: As stated repeatedly in the text, this year's phosphorus criterion assessment was intended to be template for future years when a more consistent monitoring network and dataset has been established. Due to the limitations on the interpretation of this year's analysis, the discussion of the results was minimized. The discussion of the results is expected to be expanded in future years when more definitive conclusions can be drawn from the results.

Comment: *Perhaps the phosphorous criterion rule monitoring program's design (particularly efforts to ensure consistency in data used in the analysis from year-to-year) will be available for next year's report.*

Response: Once the details of the phosphorus criterion monitoring design are finalized, they will be provided in the subsequent version of the report.

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

Response: The lines referenced above provide the components of the four-part test. The purpose of Appendix 3C-1 is to define how the value for each component of the four-part test is calculated. The appendix also clearly states that the values calculated in accordance with the appendix represent the annual and five-year geometric means specified by the phosphorus criterion rule and the EFA. Yes, the values used in the phosphorus criterion assessment were calculated according to the methodology described in Appendix 3C-1.

RESPONSES TO COMMENTS ON CHAPTER 4

Stuart Van Horn with Chapter Co-Authors

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment: *Continued research should be conducted on BMP effectiveness, appropriateness of application, and the development of design criteria is needed for BMP application in the ECP and non-ECP basins. In particular, innovative management of the drainage channels on the farms and innovative designs of BMPs in the channels themselves should be considered. In addition, while the BMP "equivalents" provide an innovative basis for BMP implementation, the "equivalents" assigned to each BMP should be reviewed periodically in light of additional experience gained with and effectiveness found for each BMP.*

Response: It is important to note that the BMP program is a regulatory program that operates within a regulatory framework to ensure that water quality standards are met. It is not a research program, although research is a necessary component of the optimization efforts. Research on BMP effectiveness, appropriateness of application, and criteria for implementation will continue within the existing regulatory framework, that is, under the specific mechanisms provided by the EFA, the BMP regulatory program for the EAA and the C-139 basin (Rule 40E-63, F.A.C. or Rule), and the permitting process. The District authority to expand on BMP effectiveness, appropriateness of application, and criteria for implementation is limited to what is required or authorized to achieve the mandated water quality levels for the individual ECP and non-ECP basins. While there may be desirable research to further improve the source control program, some initiatives are outside the District's jurisdiction or do not represent a priority to ensure District compliance with statutory requirements. Presently, research on BMP effectiveness, appropriateness of application, and criteria for implementation are considered a priority for the C-139 basin and have been initiated. Initiatives for the EAA Basin began 12 years ago and are on going.

On the issue of "innovative management of the drainage channels on the farms and innovative designs of BMPs in the channels," this is not an area of consideration for the EAA from a regulatory perspective. Much already is known about the EAA drainage system and channels, and therefore the BMP considerations have been well documented by researchers with the University of Florida IFAS extension service (UF-IFAS). The UF-IFAS researchers, in cooperation with the EAA landowners, are able to devise any such additional methods for implementation on a voluntary basis, which is encouraged by the District. Much less is known, on the other hand, about the C-139 basin drainage system and channels. Since the C-139 basin is out of compliance, activities are under way to generate information about the basin that will assist the District with implementation of appropriate BMPs. The C-139 basin faces different challenges than the EAA, especially in regard to water supply issues. An integrative approach for runoff control and water supply conservation is an area of interest that may lead to innovative BMP management options of drainage channels that will improve water quality. Information in this respect, as it is becomes available, will be reported in future SFER chapters.

Please note that the "equivalents" system is not an indicator of effectiveness. Research in the EAA has shown that effectiveness levels can vary significantly from farm to farm because of factors beyond the BMP plan. As detailed in the District's responses to the review panel for Chapter 3 of the 2006 SFER, and in the chapter itself, the equivalent system serves as a permitting tool to ensure a consistent level of effort among permittees and a comprehensive BMP plan. The equivalents system was developed through a technical and negotiated process with stakeholders and BMP experts at the onset of the EAA program. The terms "equivalents" and "effectiveness" cannot be used interchangeably.

Maintaining and improving BMP effectiveness is at the core of the long-term success of the source control program. For the EAA, research on BMP effectiveness will continue under the EFA-mandated research permit issued to the Everglades Agricultural Area Everglades Protection District (EAA-EPD); and for the C-139 basin under the District-sponsored initiatives described in Chapter 4 of the 2007 SFER. The District will continue to encourage EAA permittees to voluntarily incorporate the findings from the EAA-EPD Master Research Permit by ensuring that they participate in UF-IFAS-sponsored training programs and receive the latest information on BMP effectiveness. For the EAA, the Rule does not mandate that BMP plans be improved unless the basin is unable to comply with the phosphorus loading requirements. For the C-139 basin, the District will consider research findings to improve the mandatory BMP program as necessary to meet the phosphorus loading requirements.

In general, the authors will clarify in Chapter 4, where appropriate, the statutory authority for implementing the regulatory BMP program and how research results are considered in optimizing the program. The authors will also report in the 2008 SFER any progress made on the topics discussed in this response.

Comment: *The panel recommends that information be developed and provided that speaks to monitoring consistency from year to year so that estimated TP loadings reflect actual changes in the system rather than changes in the monitoring.*

Response: This is an area that the authors feel they have continuously improved upon. Based on panel comments for Chapter 3 of the 2006 SFER, language and summary tables were added to address this issue in the final 2006 SFER. The authors also carried this theme into Chapter 4 (chapter number changed) of the Draft 2007 SFER by adding Table 4-4, and the language on pages 4-15 – 4-16 and 4-32 – 4-34. Additionally, Appendix 4-1 is devoted to reporting more detail on the monitoring data collected at individual sites for the EAA and C-139 basins and Appendix 4-1 Tables 1 and 2 were modified over last year's report to be more readable and informative on the monitoring data. For the non-ECP basins, more cross references were added to the monitoring data reported in Chapter 3C and Appendix 3A-4, which speak to this issue. Peer review panel comments posted to the WebBoard and fielded during the peer review panel workshop presentation indicated that panel members were also interested in seeing more information (i.e., rainfall distribution and acreage reductions from land taken out of production) regarding estimated phosphorus loads for the EAA Basin based on the modeling exercise. Such information will be added to Appendix 4-1 in the final 2007 SFER.

The authors found the report content outline provided by panel members for Chapter 2 (hydrology) of the 2007 SFER was a helpful way for the panel to make suggestions on content and organization of a chapter. It would be helpful to the Chapter 3 co-authors to have something like this from panel members in advance of the draft 2008 SFER, with specific suggestions and recommendations on tables and information to include that will support the objective of monitoring consistency for reported data.

Comment: *Continued "tightening" of the chapter is recommended using summary tables where possible (the summary of activities for the non-ECP basins, and the ECP basins for that matter, could also be applied to the ECP basins) and references to background information in other documents that are readily available on the District's website or some other location.*

Response: The authors agree that continued streamlining of the chapter is appropriate. In the final 2007 SFER, the authors are adding a summary of activities table for both non-ECP and ECP basins to the summary section, and are reviewing where additional references can be added for other documents also. Please also refer to response above concerning a report outline for Chapter 3. The authors look to the panel members for further guidance on outline and content so that the "tightening" process can be continued with the 2008 SFER.

RESPONSES TO COMMENTS ON CHAPTER 5

Kathy Pietro

RESPONSES TO PEER-REVIEW PANEL COMMENTS

***Comment*:** *For the past few reviews of the STAs, recommendations have been made to the District that engineering design approaches and criteria be applied to these natural treatment systems so that these STAs may be operated within certain hydraulic and nutrient loadings so they will remove TP at high levels with confidence. . . It is clear that the engineering criteria to be applied to the design of the STA's, however, are still in development. It is gratifying to see efforts along these lines noted as part of the adaptive management approach the District is taking, an example being the 2006 "Stormwater Treatment Area 1-West Lessons Learned" document, but there is more that can be done.*

For example, there are simple relationships that can be developed from the STA operational data given in Table 5-59. Expected increases in effluent TP concentration with increasing TP loading and expected decreases in TP removal with increasing TP loading are evident although with more variability than would be expected in systems that had been in operation for awhile and had stabilized. Expected increases in TP removal and decreases in TP effluent concentrations with increasing hydraulic residence times are also evident but again with significant variability.

Envelopes of nutrient loading coupled with similar envelopes of hydraulic loading and water depths used in the past provide a growing list of design criteria that can be used to guide STA operation and design of future STA's.

Response: The original Stormwater Treatment Areas (STAs) were designed using the best available engineering and wetland science information that was in existence at that time. Because there were no similar engineered wetland systems anywhere else in the world, the designs were conceptual in nature. Now that the six originally planned STAs are complete and in operation, the District is using a combination of updated engineering and wetland science information and actual flow and water quality data to guide the operation of the STAs as well as the design of the STA expansions. The District is well aware of the relationship between increasing TP loading and increasing effluent TP concentration. The difficulty lies in the fact that the STAs are operated in an overall stormwater management and flood protection system, with the underlying intent that untreated diversions to the downstream receiving areas be minimized to the greatest extent possible.

An example of how the District is already using real-time operational data for operational decision making is the use of the operational envelopes. These diagnostic tools consist of plots of the target average annual outflow TP concentration versus the actual outflow TP concentration, target average annual phosphorus loading rates versus actual phosphorus loading rates, and target average annual hydraulic loading rates versus actual hydraulic loading rates for each of the STAs.

To summarize the diagnostic tools that are currently used to operate the STAs, the following text has been added to the chapter and to the 2007 SFER Executive Summary:

The operation of the STAs involves the participation of multidisciplinary teams and the use of integrative diagnostic tools. Real-time flow and TP load data are compared to operational envelopes, and stages in the treatment cells are monitored and adjusted to achieve target water depths between storm events. Vegetation surveys are conducted routinely to monitor vegetation conditions in the treatment cells and to implement measures to control the growth of less desirable vegetation types. Two-dimensional hydrodynamic models are used to predict the effect of structural and operational modifications, and the Dynamic Model for Stormwater Treatment Areas (DMSTA2) is used to predict STA phosphorus removal performance. Research efforts are focused on characterizing the sediment and vegetation conditions in the various treatment cells, as well as the implementation of recovery and rehabilitation plans.

These diagnostic tools will continue to be used and refined in order to assist with STA operational decision making and STA optimization efforts. Research activities will be broadened to include evaluation of the effectiveness of the full-scale demonstration projects that the District has implemented pursuant to the STA-1W Recovery and Sediment Reconsolidation plan, as well as starting new research projects aimed at better understanding biological responses to varying flows, TP loads, and depths in the STA treatment cells.

***Comment*:** *The District is breaking new ground with these STAs, particularly with respect to nutrient removal, and it can be at the forefront of guiding future applications of STA-like systems if it performs the right kind of analyses and gathers the right kind of data. It is the latter work that should be the focus of future editions of this chapter while a good deal of this information like the permit status and operations could be placed in an appendix.*

Response: The authors agree that future editions of this chapter should focus on the continued and increased use of diagnostic tools to operate the STAs; however, the reporting of the permit status and operations information in the main chapter is done to fulfill specific permit requirements. The FDEP will be consulted about placing some items, such as the permit status and operations, in the appendix. Future editions of this chapter may or may not be reformatted depending on the outcome of those discussions with the FDEP.

***Comments*:**

- *Several facts reported this year warrant a closer look into the potential problems associated with the long-term operation of the STAs. For example, the vegetation in STA-1W and STA-2 has shown stress in response to storm events, high nutrient loading and dry out. Are those observations reflecting temporary variation of the STA performance or more serious signs of aging and non-sustainability? STAs are highly managed constructed wetlands, their long-term performance and sustainability need to be re-evaluated. Most STAs are in the stabilizing stages, the data accumulated over the years should be able to provide a basis for a mid-term evaluation of the design, goals and performance of the STAs.*

- *A close examination of the factors causing operational problems in STA-1W need to be investigated further. The long-term sustainability of these systems is dependent on a good understanding of the biology of the systems as well as the engineering design that need to be applied.*

- *Increased turbidity by storm events has been identified as a significant problem in the SAV cells. Sustainability of SAV in the STAs needs to be re-examined.*

Response: The District is well aware of the fact that the sustainability of the plant communities is vital to healthy, optimally performing treatment wetlands. For this reason, the District is focusing on analyzing the existing data and developing research projects to address nutrient removal processes and biological responses to varying flows, loads, and depths. In addition to questions about the sustainability of vegetation over long-term operation, the District's current concerns involve the sustainability of vegetation following major storm events, specifically in light of the recent hurricane-prone weather period. All of this must be taken within the context, though, of the requirement to treat all stormwater discharges prior to delivery to the EPA in order to achieve state water quality standards in the EPA.

***Comment*:** *The side-by-side description and comparisons of the STAs with text and tables give excellent overview of the content. This is an efficient way to convey a multi-dimension factual data to the readers at a glance.*

Response: Thank you. The tables and figures were added to better consolidate and present the information.

***Comment*:** *The engineering design of the STA systems using the modeling approach embodied in the DMSTA2 model is predicated on a developing set of criteria. It is important that these criteria continue to be refined based on STA operation as well as on experience gained at other engineered emergent and submerged vegetation systems.*

Response: Agree. As recommended in the Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area (Long-Term Plan), the DMSTA2 model is routinely updated and calibrated by the developer, Dr. William Walker, Jr., using the latest STA performance data. Any questions about DMSTA2 should be directed to Dr. Walker. Contact information is available at http://www.wwwalker.net/dmsta/index.htm.

***Comment*:** *Vegetation management seems to be emphasized in the STAs recently. Several questions may need to be addressed: What are the goals of vegetation management in the STAs? What are the pros and cons of maintaining emergent plants, SAV and PSTA? Is there a fixed vegetation management plan to be maintained in the STAs? Or does the goal of vegetation management vary from time to time depending on the situation?*

Response: The current intent of the STA vegetation management plan is to implement the Long-Term Plan recommendations for target vegetation types in each of the STA treatment cells. In general, the intent is to have an emergent vegetation cell on the front end of the flow path and to have a submerged aquatic vegetation (SAV) cell at the end of the flow path. The reason for this particular recommendation is that emergent vegetation can better reduce TP concentrations at higher levels, and SAV generally performs better at TP concentrations below 50 ppb. SAV can also then further reduce TP concentrations to levels lower than can generally be achieved with an emergent marsh alone. The vegetation management intent is also to keep floating aquatic vegetation at maintenance levels to prevent the shading-out of SAV. Prior performance and millions of dollars of research from the Advanced Treatment Technologies program established the justification for these types of vegetation schemes. Aerial flights are conducted monthly to assess the vegetation management needs and recommendations are made through the site managers and the research teams. The vegetation management plan does vary from time to time, depending on the situation (i.e., regrowth during and following construction activities); however, the overall intent is to follow the Long-Term Plan recommendations, unless modified through the required revision approval process.

***Comment*:** *The Analysis and Interpretation section will become more important as STAs stabilize because future management decisions depend on the past experience. This section needs to be streamlined, focusing on the critical issues of STA operation and performance.*

Response: The authors will continue to refine this section as more full-scale STA performance data become available, to better focus on analyzing the critical issues of STA operation and performance.

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

Response: Thank you. Tables and figures were added to better consolidate and present the information. The recommendation for reorganization of the chapter for the 2008 SFER will be taken under consideration.

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

Response: Peat is scraped off in Periphyton-Based Stormwater Treatment Area (PSTA) cells primarily to remove a growing medium for emergents, which if allowed to grow would shade out the periphyton. The long-term maintenance needs of a PSTA system are still uncertain and the full-scale systems will help in understanding this issue. The potential need to remove accumulated residuals in PSTA systems on a periodic basis is seen as a liability for this technology. Answers to these types of questions are anticipated to be obtained from the full-scale PSTA demonstration project in STA-3/4.

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

Response: In addition to wildlife and recreational activities, tours (e.g., educational or for visiting dignitaries) are also conducted. In all of the STAs, the recreational facilities plans include informational kiosks for educational purposes. The District produces outreach publications which are periodically updated with new information. Public communications meeting notices are posted on the District's meeting calendar and all STA information is available to the public on the website.

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

Response: Turbidity was most pronounced in areas where the plant communities were destroyed (mainly in the SAV-dominated areas). Turbidity was not directly linked to increases in TP. It is uncertain how turbidity affected the other water quality parameters.

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

Response: Agreed. The tables showing the individual cell-by-cell loading budget estimates for soluble reactive phosphorus, particulate phosphorus, dissolved organic phosphorus, total nitrogen, ammonia-nitrogen, nitrite+nitrate-nitrogen, alkalinity, calcium, and chloride were moved to the appendix.

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

Response: In general, water depths are kept slightly deeper in SAV cells to discourage emergent vegetation growth. The question of whether deeper water enhances SAV density needs further investigation. The water depths are kept at target stages for plant health, and the impact of various water depths on removal efficiencies will be examined. The emergent vegetation strips were established to reduce wave action in SAV cells.

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

Response: The ammonia-N data were added to the appendices.

***Comment*:** *The Analysis and Interpretation section of the chapter could not be found.*

Response: This section was included in the draft but was overlooked by the reviewer. An email was sent to the reviewer listing the page numbers where the section could be found.

RESPONSES TO COMMENTS ON CHAPTER 6

Fred Sklar with Chapter Co-Authors

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment: *It is perhaps time to integrate these four ecology areas (wildlife, vegetation, ecosystems, and landscapes) and produce a discussion of how they, and the measures used to evaluate ecology of the Everglades, are inter-related. A short statement should be included in the summary of how the four research areas are inter-related – how they related and inform one another.*

Response: The authors agree and propose a synthesis of the past ten years of Everglades research that has been published in previous Interim Reports, Consolidated Reports, and SFERs. Excluding any major diversions such as hurricanes, the authors will work on this as an appendix to this chapter in the 2008 or 2009 SFER.

Comment: *A short statement should be included in the summary of how the four research areas are inter-related – how they related and inform one another.*

Response: A statement has been added.

Comment*: A clear statement should be provided of the agencies involved in all research areas, both in the summary and in each research section.*

Response: As almost all of the authors' work is of a collaborative nature, this is an important point. The following list of contributing agencies, corporations, and universities, have been recognized in this chapter in the final report: Florida Atlantic University (FAU), Florida International University, Florida State University, University of Florida, the Solid Waste Authority of Palm Beach County, the FDEP, ENP, Florida Fish and Wildlife Conservation Commission, USFWS, USGS, Partrac Ltd., and National Audubon Society.

Comment*: There is still a need to relate the specific research to the goals of CERP - how are the data used in short and long-term goals? How are the data used in the "weekly" management meetings? What operations depend on ecological data?*

Response: These are important and critical questions, and they are asked of all research sponsored by the Everglades Division. If the scientific staff cannot demonstrate these relationships to upper management and colleagues, then it is not funded. Keep in mind that staff can only discuss potential relationships. Research data cannot be used to set CERP performance measures or influence weekly operations until results are peer-reviewed, accepted, and implemented into a management strategy. Staff recognize that all applied research needs to clearly show potential benefits, and the authors will do a better job of this by making sure each project highlights its application and by adding a summary table to the summary section of Chapter 6.

Comment: *While the new research is both important and laudable, the rationale for some of the studies (e.g. DNA of cattails) is unclear.*

Response: The rationale for each study will be made clearer in the revision. Regarding the cattail (*Typha* spp.) DNA study, it is exploratory research and based upon the finding that cattail invasions in three national parks in the Great Lakes region was largely due to the hybridization of a European invader and native cattail species (Marburger et al., 2005). If the authors understand the origins of invasive cattails in the Everglades, their genetic background, and their genetic expression along a nutrient gradient, then they might be able to develop adaptive management strategies based on the molecular information.

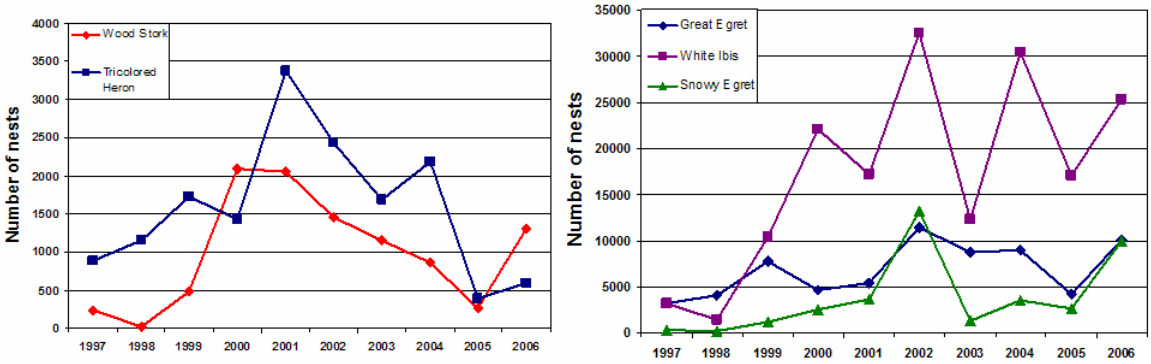
Comment*: The introduction does not provide a clear statement of why the overall research areas or specific research topics were chosen.*

Response: The following statement has been added to the Introduction:

> Through biological monitoring and research, the Everglades Division is actively developing and evaluating bioindicators that can be used to characterize the current status of the Everglades and that allow for tracking and predicting significant changes that may result with respect to ecosystem management or restoration. The ultimate goal is to convey biologically derived information that can be used for environmental decision making.

Comment: *This section (wildlife) would be improved by more tables and figures that show the numbers for this season (not just 3 year averages), especially for key species, such as Snowy Egret and Wood Stork.*

Response: The following two figures were added:



Comment*: Provide another table that gives wading bird numbers for Everglades areas in addition to WCAs and ENP.*

Response: In an effort to enlarge on an Everglades-centered analysis of wading bird populations, the District's current systematic reconnaissance flight (SRF) modeling contract is testing the "Distant Magnets" hypothesis (i.e., that areas outside the Everglades are reducing the numbers of birds breeding in the Everglades). This statistical modeling of 17 years of multiagency SRF data from the entire Everglades is expected to be completed by the end of 2006 and summarized in the 2008 SFER.

***Comment**: Provide a table of all the wading bird targets (not just numbers, but distribution and timing ones as well, page 6-10).*

Response: This is more complicated than what can be put into a table. Therefore, page 6-10 has been rewritten to address this concern. In general, it states that recovery of pre-drainage wading bird nesting patterns will be measured using four parameters: (1) numbers of nesting pairs for the five species, as shown by three-year running averages of nesting numbers, (2) a recovery of nesting in the region in the traditional "rookeries" in the southern, mainland estuaries downstream from Shark Slough, (3) a return to early (December–January) dry season nesting by wood storks (*Mycteria americana*), and (4) an increase in the frequency of supra-normal nesting events.

***Comment**: What are the criteria that determine the number of species target nests?*

Response: Target numbers are based on known numbers of nests for each species during the pre-drainage period (1930–1940), and which were summarized by Ogden (1994).

***Comment**: It says that wading birds are excellent indicators of wetland ecosystem health (L232) and WCA-3 supported the largest number of nests (55 %) whereas ENP supported much less nests (22%). Does it mean WCA-3 is healthier than ENP?*

Response: This is a very interesting question and highlights how much staff still need to learn about wading birds. Observations from monthly SRFs reveal that numbers of wading birds foraging in ENP and the WCAs are comparable, which strongly suggests that overall productivity is similar between the two regions. However, why more birds nest in the WCAs is not entirely clear. Historically, "supercolonies" in ENP were located in the mangrove estuaries. If loss of freshwater flow has reduced the productivity of the estuaries and resulted in the reduction in wading bird nesting effort, then the health of ENP has declined relative to the pre-drainage period. This does not explain, however, why large colonies are not found in other regions of the ENP. Shark River Slough, for instance, is considered a particularly productive area for wading bird foraging, so why are large colonies not found in this area? And, why is it that low-population waders like the roseate spoonbill (*Ajaja ajaja*) and wood stork favor the ENP? In this respect, the ENP could be considered healthier for endangered and threatened species, but less healthy for white ibis (*Eudocimus albus*).

***Comment**: The supplemental feeding study with white ibis should include analysis of contaminants, particularly mercury […and] normal reproduction and growth parameters should be provided for other, non-optimal food years.*

Response: There are no data for non-optimal food years. The point of this multiyear study is to make comparisons between good and bad years. The predicted 2007 wet winter as a result of the current El Niño is likely to reduce food availability for next year's breeding season and induce relatively poor breeding. To understand possible covariance associated with contamination, an experiment in collaboration with FAU incorporates a physiology component, which will examine collected feather samples from nestlings. In addition, the authors are in consultation with Dr. Peter Frederick (University of Florida), who currently manages an aviary experiment examining the effect of mercury (Hg) on ibis breeding success.

***Comment**: 1) It is not clear how tree island biomarkers will be used, particularly with respect to wading bird performance measures. 2) Further, some attention should be devoted to mercury.*

Response: (1) To be clear, this is in a techniques development phase, so biomarkers might not be used. It has been hypothesized that the existence of large colonies in the interior of the Everglades is a recent phenomenon, and CERP refers to restoring the pre-drainage coastal colonies. If it ever becomes possible to quantify the number of birds at a colony using markers, then the authors will be able to reconstruct natural variation in nest numbers and numbers of active colonies. This variation would directly influence a performance measure for nest numbers. (2) The authors agree that the mercury–bird link is an important one. However, there are other more detailed studies that use appropriate clean sampling strategies that are assessing the influence of mercury in this system. If upon refinement of this pilot study it is found that tree island biomarkers can be linked to historic wading bird distributions and abundance, then future linkages with historic mercury accumulation and distribution will be considered.

***Comment**: The wading bird biomarkers should be examined not only in marsh cores, but also in other tree islands that have never served as wading bird colony sites.*

Response: Staff agree that a control tree island should be examined and that was part of the original sampling strategy. However, it is difficult to determine which tree islands have never been used as colony sites. Based on a recommendation from an Everglades avian ecologist, staff selected a small tree island as a "control." However, upon arrival to sample that site, staff observed the entire island was covered with bird guano, which appeared to be from the two or three pairs of great blue herons (*Ardea herodias*) that were nesting there. Thus, further search for an island that does not have any history of bird use is under way; in the interim staff has used the marsh as an indicator of unimpacted soil conditions. Interestingly, because the hypothesis in Wetzel et al. (2005) is that the growth and sustainability of an Everglades tree island may be dependent on nutrient inputs from wading birds, no one may be able to find a tree island that meets the criteria of never having wading bird nutrient input. Rather the biomarkers, when linked with dating, may show the degree and timing of use.

***Comment**: 1) It is hard to believe that ortho-P consists of 75% of the total P in the sediment while organic P consists only 10-15 %. Orthophosphate is hardly available to plants. 2) Only organic P is available to plants. 3) How long can uric acid persist in the soil?*

Response: (1) This section is talking about phosphorus identified using 31P-NMR, so the 75 percent relates to the NaOH-EDTA extraction of the soil that occurs prior to solution nuclear magnetic resonance (NMR) spectroscopy, this does not relate to 75 percent of all available phosphorus. However, inorganic phosphorus can represent the majority of phosphorus on tree islands, for example in phosphorus fractionation that was conducted on 3BS1, HCl extractable phosphorus (i.e., inorganic phosphorus), represented 90 percent of the entire phosphorus pool in the surface sediments. (2) While the direct uptake of organic nitrogen has been documented in the literature, the authors are not aware of any studies that show the direct uptake of organic phosphorus by plants. It is generally accepted that organic phosphorus compounds must be transformed to the available inorganic forms prior to uptake by plants. (3) One of the characteristics of the biomarkers the authors are trying to identify in this pilot study is the ability to persist in the soil. That the uric acid was found with depth indicates that it persists over considerable lengths of time.

***Comment**: For the isotope pulse-chase experiment: 1) I do not quite follow the experimental design, results and interpretation of this study….I think some of the studies require more rigorous description and interpretation than it is in this report. 2) What was the rationale for the length of the periphyton study. 3) Refer to supporting methods literature, and describe methodology. It would be helpful to describe the floc in more detail. Line 431 – please explain "isotope type". Line 435 is confusing.*

Response: The SFER is not meant to be a highly technical report and yet much of the Everglades science is very technical. The authors felt that this pulse-chase experiment should be presented even though it is very technical, because techniques are new and results may be groundbreaking. However, SFER space is limited and more detailed descriptions are being written for journal publication, which will be cited in the 2008 SFER.

***Comment**: Define floc…*

Response: This has been inserted into Chapter 6:

> It is difficult to formally define the term flocculent sediment (also referred to as floc or a floc layer), because it is not a water column component found in all wetlands. Floc is an easily resuspended, very low density, unconsolidated, almost purely organic material that is composed of living and dead algal material, as well as bacteria and decaying plant matter. It has been hypothesized that transport of floc through sloughs of the Ridge and Slough landscape helps create and maintain its characteristic "corrugated" microtopography.

***Comment**: What is the application of the Sediment Flux Study?*

Response: There is limited information regarding the interaction between flow and the physical transport of particulate matter, both in terms of nutrient influxes and as a force capable of shaping the landscape. This study fills a critical information gap by addressing the issue of floc resuspension and distribution as a function of threshold velocities. Understanding nutrient and carbon transport may be the key to Everglades restoration and to rehabilitation of regions where the slough communities are disappearing.

***Comment**: More details on the Invasive Species Summit should be given, particularly concerning the relationship between future ecological studies and invasive species.*

Response: This statement was added:

> The 3rd Annual Everglades Invasive Species Summit was held at Big Cypress National Preserve in July 2006. The primary goal of the summit was to improve cross-agency communication and develop an effective, coordinated, invasive species control strategy for the Everglades region. A steering committee was formed to integrate resources between governmental agencies, tribes, and other stakeholders, and to provide guidance. The Summit produced an outline for a comprehensive research plan for invasive exotic species. The objectives of the research plan are to identify the needs and gaps in exotic invasive species research, and to provide recommendations and actions for future studies.

***Comment**: While the tree island research is obviously critical, no clear objectives were stated, making it difficult to evaluate.*

Response: This statement was added:

> The main objective of the tree island program is to assess changes in forest structure and ecosystem function in response to changes in water levels, hydroperiods, and the timing and frequency of inundation, toward restoring and preserving these biodiversity hotspots. A secondary objective is to understand tree island origins by relating tree island nutrient and biogeochemical cycling to island productivity and health. The particular objective of this 2006 SFER tree island update was to assess the effects of Hurricane Wilma on tree island health and resiliency as a function of hydrology and water management.

***Comment**: In reference to the FIRE experiment: This section would benefit from more explanation about what is know experimentally about fire in the Everglades, both temporally, seasonally, and spatially.*

Response: This was added:

> There are very few scientifically sound studies that quantify fire's temporal, seasonal, and spatial effects, particularly in the northern Everglades. Many aspects of fire ecology in the Everglades have yet to be studied. The authors believe that the FIRE study will help fill some of those gaps by focusing largely on spatial and temporal effects. The authors know that naturally induced fires (i.e., lightning strikes) are most common during the summer wet season, however it has been found that burning right before the growing season when water levels are low (March–May) provided greater benefit to sawgrass growth than burning in October to December (Forthman, 1973). Forthman (1973) also found that two years of burning did not diminish the ability of sawgrass to regenerate. Ponzio et al. (2004) noticed that after a single summer burn, both sawgrass and cattail initially increased in density but returned to pre-burn levels within three to four years.

***Comment**: What is the District's position on wildfires, and what management is done?*

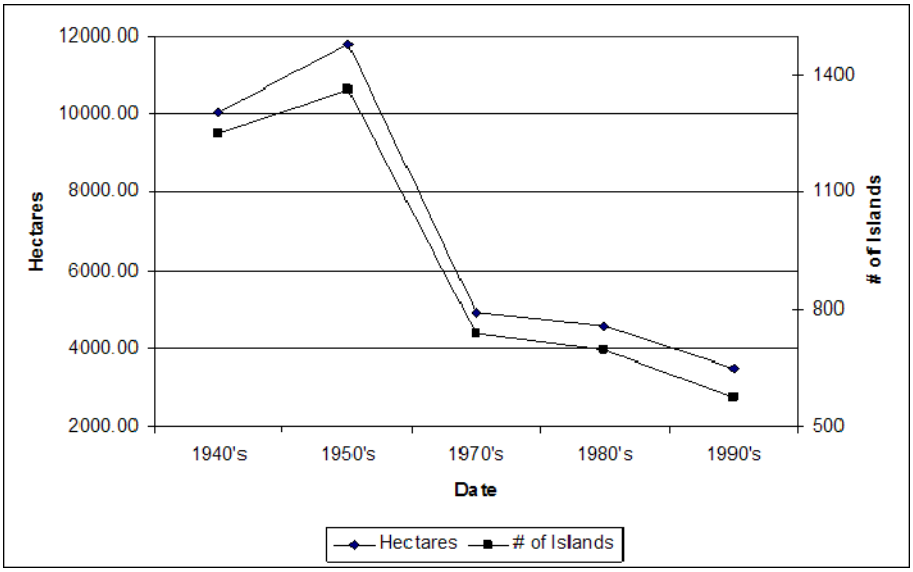
Response: Climate forecasting by the District helps prevent peat fires. If one occurs, water is diverted to the area to put it out. All other fires are allowed to burn, unless the Florida Fish and Wildlife Conservation Commission (FWC) were to recommend to the contrary. The FWC is the agency with the mission to conduct prescribed burns in the Everglades.

***Comment**: A fuller description of the results of the tree island elevations studies should be included.*

Response: This is baseline sampling that will not be completed until all 600 islands in WCA-3 have been measured in 2008. The goal is to produce a map that shows the tree island elevations in terms of both absolute height above sea level and relative height above the surrounding marshes. This is needed for regional water management and to better predict tree island population response to CERP restoration plans. This section of the SFER has been included as a status report. A fuller description of the results will appear in the 2009 SFER.

***Comment**: I found the tree island change maps hard to follow, and would have appreciated some summary statistics in a table.*

Response: This figure of hectares and number of tree islands in WCA-3, for each time period, has been added to Chapter 6.



***Comment**: The same overall format should be used for reporting the research (introduction, scientific details, results and discussion) studies throughout the report. As is, it was mainly used in the wildlife section.*

Response: The SFER is a status report and if this more technical format were to be followed for all projects, then Chapter 6 would be over 100 pages. Every year projects of "special interest" are selected for more detailed descriptions.

***Comment**: Future food web studies should be considered that involve larger mesocosms with more complex food webs.*

Response: Staff will consider this recommendation.

***Comment**: All studies presented in this chapter should have clear hypotheses stated in their respective introductory sections.*

Response: See the new summary table in the summary section of Chapter 6.

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Wetzel, P.R., A.G. van der Valk, S. Newman, D.E. Gawlik, T. Troxler Gann, C. Coronado-Molina, D.L. Childers and F.H. Sklar. 2005. Maintaining Tree Islands in the Florida Everglades: Nutrient Redistribution is the Key. *Frontiers in Ecology and the Environment*, 7: 370-376.

RESPONSES TO COMMENTS ON CHAPTER 7A

Beth Williams and Larry Gerry

GENERAL RESPONSE TO PEER-REVIEW PANEL COMMENTS

The Peer Review Panel observed that the link between the Comprehensive Everglades Restoration Plan (CERP) and the Acceler8 initiative is more clearly presented in the 2007 South Florida Environmental Report (SFER) than in previous reports. The Panel noted that the background section of ecological programs and their relationship to CERP also helps the reader draw logical conclusions as to the pace and status of the overall restoration effort.

The Panel considered the addition of the background to be a welcome development, in particular, the section describing the overall restoration effort. The Panel approved of the authors' choice of words ("Everglades-type" and "such characteristics"), as well as the frank admission that the Everglades will not recover many of its defining characteristics. The Panel advised that this presents a more accurate picture of the outcome of CERP, and commended the authors for the treatment.

The Panel reiterated its insistence that restoration is an ongoing process leading to measurable improvements in ecosystem functioning based on defined parameters and not a specific target, especially for the objectives of multiple stakeholders. The Panel advised that it is fine to set specific targets (such as 10 ppb Total Phosphorus) but controlling that target implies any number of ancillary benefits and costs to the stakeholders involved. The Panel recognized that organizing the background section by region was also an important change from last year's report.

The entire middle section of the chapter was commended by the Panel as well organized, easy to read and output oriented. The regional / problem / solution approach allows the reader to cross-reference the issues presented with proposed CERP and Acceler8 activities. The Panel stated that this chapter will be an important asset to the final monitoring program design; and that it represents a marked improvement to previous years' reports.

The Panel noted that it is important that all involved in the restoration process understand that CERP is designed to impact the Everglades system. As is clearly stated in this chapter, no single CERP activity will solve a system-wide problem. The Panel recommended strongly that this concept be included in other chapters of the SFER.

The Panel observed that CERP goals are clearly defined as preserving South Florida's ecosystem and providing for the water-related needs of the region – both related to improving the timing, quality and distribution of water deliveries to the ecosystem. In order to accomplish the goals of CERP, the District must complete the land acquisition program while preparing Project Implementation Reports (PIRs) based on data collected from a host of restoration actions.

The Panel remarked that the section reporting the status of program-level activities is excellent as it clarifies the status and interactions of many CERP programs. The map provided to

locate the pilot projects is useful and allow the reader to gain a certain degree of understanding as to the complexity and inter-related nature of the overall restoration program.

The Authors gratefully acknowledge the thoughtful and attentive review of the Panel and the Panel's comments.

Following are the Panel's specific comments and recommendations, and the Authors' responses.

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment: *The panel recommends that the public relations efforts being mounted to inform the general public on progress realized in the Acceler8 program be made part of the 2008 SFER.*

Response: The authors support this recommendation, and will highlight such outreach efforts, tools, and events such as:

- The Official Acceler8 Website. This site provides information on the Acceler8 initiative, its projects, project maps, news releases and answers to questions. It is being expanded to include technical information, procedures and a library. Access this site at http://www.evergladesnow.org.
- News Releases and Newsletters. Groundbreaking ceremonies and other milestones are announced through news releases, and a monthly electronic newsletter provides timely articles. View the newsletter at http://www.sfwmd.gov/newsr/enews/A8_eNews.html.
- Outreach Events and Public Meetings. These include District-hosted Everglades teacher workshops, in which secondary teachers learn about current ecosystem issues and restoration efforts from Environmental Scientists, and explore the Everglades by airboat while earning in-service credit.
- Business Outreach. The Construction Symposium and Exhibit, is a significant factor in the success of Acceler8. At this annual event, information is exchanged with prospective consultants, contractors and vendors on the Acceler8 projects, as well as on such topics as the District's Small Business Enterprise program, owner-controlled insurance program, and work force training opportunities

Comment: *The difference between "yellow book projects" and "precursor projects" should be clarified in the report.*

Response: It is an important difference.

- "Yellow Book Projects" are CERP Projects, or more specifically, they refer to those detailed in the Central and South Florida Project Comprehensive Review Study. The study was authorized by the Water Resources Development Act of 1992. The study examined the Central and Southern Project to determine the feasibility of modifying the project to restore the South Florida ecosystem and provide for other water-related needs of the region. This resulted in The Final Integrated Feasibility Report and Programmatic Environmental Impact Statement, which was transmitted to Congress on July 1, 1999.
- A strong federal-state partnership has been established for restoration of the Everglades ecosystem both for CERP implementation and for implementation of the projects that

form the foundation for the CERP. The "Precursor Projects" or "Foundation Projects" are those that were assumed to be completed before certain CERP (Yellow Book) projects and components could be implemented. Key among these Precursor or Foundation Projects is the Modified Water Deliveries to Everglades National Park Project (Mod Waters) which will establish more natural flows to Everglades National Park and contributes much of the early increases in sheetflow.

The authors will revisit these sections and ensure that this difference is clear in the final document.

Comment: *The final document should clearly state that the Adaptive Management Program should be used throughout the construction and monitoring phase of the restoration of the Everglades.*

Response: The authors agree and will state in the final chapter that adaptive management will be used throughout the construction and monitoring phases of CERP.

Comment: *The staging or sequencing of project implementation (decompartmentalization, predecessors, successors, etc.) vis-à-vis the commitment of the State for 50% funding should somehow be clarified in the final report with a simple diagram.*

Response: The sequencing of projects in the South Florida Ecosystem Program is presented in the Master Implementation Sequencing Plan (MISP). The MISP considered component packaging, benefits, predecessor/successor relationships, and task durations, and was refined by resource leveling. View the MISP at http://www.evergladesplan.org/pm/misp.cfm.

The authors will try to fuse the MISP output with current cost sharing projections and the dynamics of Acceler8 into a simple and accurate diagram for inclusion in the 2008 SFER, and will appreciate the Panel's further guidance in this matter.

RESPONSES TO COMMENTS ON CHAPTER 7B

Kimberly Chuirazzi

RESPONSES TO PEER REVIEW PANEL COMMENTS

RECOVER appreciates the review panel's support and guidance. The authors will continue using the current format as the panel finds it desirable. They will continue to refine and integrate performance measures using a science-driven process and using adaptive management for appropriate projects as supported by the panel in the body of their review on Chapter 7B. The following is the author's response to the two specific recommendations made:

Comment 1: *The panel supports the need for greater detail in terms of reporting on progress realized in the RECOVER and CERP Programs.*

Response 1: The final version of Chapter 7B includes more detail on several RECOVER products and activities for which the panel requested additional information including the Benefits Evaluation and Analysis Methodology and the status of predictive tool development. Next year, the findings in the Pilot System Status Report will be summarized in Chapter 7B, which should supply the most detail on RECOVER progress to date.

Please note that Chapter 7B reports on the current progress of the RECOVER program, while Chapter 7A reports on the remainder of the CERP program.

Comment 2: *The panel supports the need for continued inclusion of more social science data as important improvement in implementing CERP.*

Response 2: The authors appreciate the panel's support. Progress of this effort will be reported in next year's chapter.

RESPONSES TO COMMENTS ON CHAPTER 8

Tracey Piccone

RESPONSES TO PEER REVIEW PANEL COMMENTS

Comment: *The panel also notes that previous SFERs have recognized that additional measures are necessary to achieve the overall Everglades water quality goal as required by 31 December 2006 by the Everglades Forever Act. There was no mention of this deadline, however in this year's Chapter 8.*

Response: Regarding the December 31, 2006 date, it should be noted that the 1994 EFA laid out a process for achieving water quality goals. The 2003 amended EFA further recognized that additional measures would be necessary beyond December 31, 2006 to achieve overall Everglades water quality goals. The Long-Term Plan is the state's blueprint for achieving these goals.

Comment: *The panel supports inclusion of the ACME Basin B project into the long-term plan as a means of securing funding for the important action to the overall water quality efforts of the CERP as well as the exclusion of proposed internal levees of STA-2 Cell 3, STA-6 Section 1 and STA-6 Section 2 from the long-term plan. However the panel notes with some concern the lack of a response to overall P levels as a result of the installation of the levees.*

Response: Regarding the comment about the response to overall phosphorus levels as a result of the installation of the levees, the following is offered. In some cases, but not all cases, adding levees does not necessarily result in predicted improved phosphorus removal. This may be partly due to the fact that the subject treatment cells are already performing very well without the levees, so the model is not able to predict any noticeable improvement in the "with-levee" condition. In STAs with performance that has not been as good as STA-6 Section 1 and STA-2 Cell 3, the model does predict noticeable improvement in the "with-levee" simulations as compared to the "without-levee" simulations. In those STAs, the levees are being installed as recommended in Long-Term Plan.

Comment: *The panel understands that many CERP projects are still in the early planning stages and therefore it is unclear as to how these projects will affect water quality. Yet there was only passing reference to the monitoring program that will have to be in place in order to be able to make specific recommendations for long-term water quality policies.*

Response: The panel's comment about the nature of the CERP monitoring program that will need to be in place in order to make specific recommendations for long-term water quality policies should be directed at other SFER sections such as the chapters on CERP and RECOVER. Chapter 8 of this volume addresses the EFA water quality program, while CERP is a separate restoration program with some water quality components.

Comment: *A review of the Long-Term Plan continues to raise issues related to monitoring as a way of gathering new data and improving the Plan itself. In Sections 5 "PDE" and 8 "Operation, Maintenance and Monitoring" of the 2004 SFER, the operational aspects of monitoring progress toward attaining water quality goals were noted.*

Response: Regarding the comment about Part 8 of the Long-Term Plan called "Operation, Maintenance and Monitoring", the following is offered. This section of the Long-Term Plan involves the routine Operations and Maintenance (O&M) activities and costs associated with the STAs, as well as the monitoring costs associated with the STAs. More specifically, the STA monitoring includes flow and water quality monitoring at the STA structures, and does not include monitoring in the Everglades or the downstream receiving areas. If SFER panelists are interested in the ongoing monitoring activities in the Everglades, they should refer to the SFER chapter on Everglades water quality.

Comment: *[While] the operational aspects of monitoring progress toward attaining water quality goals were noted[...]neither the 2006 nor 2007 SFERs provide further insights as to how such information will be treated legally or scientifically as implementation of new projects proceeds, in the opinion of the Review panel.*

Response: Regarding the comment about how the operational monitoring will be treated legally or scientifically, the following is offered. New scientific information is incorporated into the Long-Term Plan through the adaptive implementation process and by following the precise Long-Term Plan revision process laid out in the Long-Term Plan. This adaptive implementation process has been used very successfully to date in implementing the Long-Term Plan as highlighted in the chapter and in the Chapter 8 workshop presentation. As far as how new information is treated legally, as described in the Long-Term Plan revision process laid out in the Long-Term Plan, the EFA (state law) states that revisions to the Long-Term Plan must be approved by the FDEP. The EFA also requires that the District report all revisions to the Long-Term Plan in annual reports (now included in the SFER), which has been done every year since Long-Term Plan implementation began. The District has been in full compliance with this requirement as all revisions to the Long-Term Plan have obtained letters of approval from the FDEP. These letters are posted on the Long-Term Plan website. Furthermore, as changes to the Long-Term Plan are approved, the District and the FDEP work together to evaluate any potential impacts on the state and federal permits for the Long-Term Plan projects, and adjustments to these permits are made as appropriate.

Comment: *The panel continues to feel that the concept of STA optimization should be considered as an issue for the cross-cutting issues, since the success of the STAs has an impact on the entire South Florida environment. It would be interesting to zero in on the role of STAs as a fundamental management strategy to the overall CERP.*

Response: Regarding the comment about a cross-cutting chapter on STAs and the role of STAs in CERP, this should be the subject of the CERP chapter, not the Long-Term Plan chapter. The STAs that are part of the Long-Term Plan are discussed thoroughly in Chapter 5 of this volume.

Comment: *The panel feels that some of the results of implementing BMPs should, at minimum, be cross-referenced in this chapter, as has been the case in other projects as a means of understanding the impact of individual and/or suites of BMPs on water quality.*

Response: Regarding the comment about BMPs, the panel should refer to Chapter 4 of this volume, which thoroughly covers BMPs. In the interest of not repeating the same information in multiple chapters, readers of Chapter 8 are referred to Chapter 4 for BMP information.

Comment: *A description of the environmental engineering of these systems should be included in this chapter – for example, a review of the DMSTA model.*

Response: Regarding the comment about DMSTA, the panel should refer to the website of Dr. William Walker, Jr. (http://www.wwwalker.net/dmsta/index.htm), since he developed and maintains the model and is therefore the best person to provide a review of the model.

The authors look forward to discussing many of the above comments with the peer review panel next year at the workshop, as the panel appears to be providing and repeating some fairly general comments each year.

RESPONSES TO COMMENTS ON CHAPTER 9

Amy Ferriter[4] with Chapter Co-Authors

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment: *The involvement of the general public in the effort of nonindigenous species control is essential to the success of this task. Efforts should be made to educate the public in the problem and significance of exotic invasive species control in South Florida. Special outreach programs for students from K-12, advertisement in media, public workshops and websites are all effective means for public education. Volunteers from the general public would be a powerful force in the effort of exotic species control, in private-owned lands. Reporting public education efforts and programs in this regard probably should be included in this chapter.*

Response: The authors agree that this aspect of the issue is extremely important. Based on the Peer Panel recommendation, the following text has been added to the chapter:

> Public awareness of invasive species and their impacts to Florida's natural resources is an important component of successful invasive species prevention and management efforts. If the rate of new introductions of potentially invasive non-native species is to be curtailed, behavioral changes of individuals and industries should be pursued. A 2006 FWC-funded invasive species awareness study found that roughly 50 percent of Floridians have some knowledge of invasive species issues and most strongly agree that invasive species represent a significant threat to Florida's natural resources and human welfare.
>
> State and federal agencies involved with natural resource protection have a variety of existing programs to educate the public and industries. Printed media, such as weed identification cards and flyers, are regularly produced by agencies and distributed to the public at outreach events. For example, the FWC collaborated with other agencies to publish an eight-page insert on invasive species in a 2005 Sunday edition of the Orlando Sentinel. The insert reached approximately 600,000 readers. A South Florida edition is planned for publication in the Miami Herald during 2007.
>
> Additionally, invasive species educational content has been expanded on agency websites, and agencies are improving cross-agency website linking to further facilitate access to invasive species information. The ISWG has also established its own website, which includes ISWG information and links to other ISWG agencies.
>
> Despite the existence of these outreach and education programs, the FWC survey suggests that more effort is needed to raise invasive species awareness among Floridians. Additional funding and improved interagency coordination are needed to adequately reach the growing and often transient Florida population. The Statewide Invasive Species Strategic Plan for Florida recognizes the importance of public education and calls on the ISWG to make recommendations for developing a coordinated public awareness

[4] Boise State University, Boise, ID

> campaign. ISWG established a public education sub-working group in 2004 to address this goal. The group is composed of communications professionals from ISWG member agencies and is charged with providing specific recommendations on implementing a public awareness campaign. The sub-working group is also cooperating with a new interagency invasive species awareness effort being coordinated by the FWC.

Comment: *Pictorial description of the priority nonindigenous species should be included in the chapter, especially plants. If the length of the chapter is of concern, cross reference to web site can be made.*

Response: The authors thank the panel for this suggestion and have added photos to the chapter when available and appropriate.

Comment: *Concluding remarks at the end of the chapter should include comments on the gap of the current efforts, special notes of problems, and future needs in management, planning, research and funding.*

Response: This comment is appreciated and the authors are developing the suggested language for inclusion in the final chapter.

RESPONSES TO COMMENTS ON CHAPTER 10

Joyce Zhang, R. Thomas James,
Gary Ritter and Bruce Sharfstein

RESPONSES TO GENERAL COMMENTS

Comment: *Regarding the watershed, how serious/widespread is the problem of residual soil phosphorus (p-10-30)?*

Response: Based on the phosphorus budget study (Hiscock et al., 2003), about 85 percent of the net import is stored in the upland soils. The imbalance between import versus export contributes to the net buildup of phosphorus in the watershed.

Comment: *Is the District (and partner agencies/entities) developing a concerted plan for controlling urban/suburban runoff?*

Response: The FDEP develops BMPs for urban/suburban runoff as well as educational programs. Under the LOER initiative, agencies are working with the fertilizer industry to produce and distribute low- or no-phosphorus fertilizer statewide. Additionally, the SFWMD and the FDEP work with the municipalities to implement lawn fertilization BMPs.

Comment: *Was there an effort to quantify the P contribution from the sediments that were resuspended from the central lake?*

Response: Phosphorus contribution is estimated from yearly nutrient budget analysis. A few additional statements were added to clarify.

Comment: *How reliable are the reported estimates for atmospheric deposition of phosphorus, and is this source considered "uncontrollable"?*

Response: Atmospheric deposition is a difficult process to measure. There is much variability. The values used for the Lake (FDEP, 2001) are based on review of rainfall network data and best professional judgment. The source is considered uncontrollable.

***Comment**: Why was there a reduction of water-column calcium (p.10-35, line 780)? Given that calcium is effective in sequestering phosphorus and precipitating it out of the water column to the sediments, why is the option of adding calcium (lime) not considered?*

It was mentioned in the Sept. 2006 Workshop that alum (aluminum) was planned for use in sequestering/precipitating phosphorus from the water column, rather than lime, because of lower cost. It is important to consider, however, that alum, unlike calcium, can be toxic to some beneficial aquatic organisms.

Response: Calcium (Ca) typically precipitates phosphorus in a pH range that is only encountered in the Lake in dense beds of SAV, or in the midst of phytoplankton bloom activity. Calcium has been shown to be ineffective in precipitating phosphorus under conditions similar to those that prevail in Lake Okeechobee. Nevertheless, the District does intend to investigate Ca, as well as a number of other chemical compounds as potential methods for sequestering phosphorus in the Lake.

***Comment:** Increased sulfur loads originating from polluted surface water and groundwater, and from enhanced atmospheric inputs, are a major threat to the biogeochemical functioning and biodiversity of shallow freshwater ecosystems. Thus, sulfate reduction may be an important biogeochemical process in the eutrophication of Lake Okeechobee. For example, in field enclosure experiments, Lamers et al. 2002 (Limnology and Oceanography, volume 47, pp. 585-593) observed striking responses of freshwater marshes to sulphate. Sulfate addition often promoted strong phosphorus mobilization. A similar phenomenon was also recently reported from an enclosure study in the Everglades (see draft 2007 SFER, Appendix 3-B3). How high are sulfate concentrations in the Lake, and how does sulfate reduction quantitatively affect phosphorus availability to the phytoplankton? Sulfate reduction may also influence internal trace metal micronutrient cycling and methylmercury availability.*

Response: Sulfate concentrations have declined in the Lake (like most other ions) from around 60 ppm to less than 30 ppm. No research has been conducted on sulfate's impacts on nutrient cycling in Lake Okeechobee.

***Comment**: Widespread inundation of urban and agricultural lands during and after the storms likely resulted not only in increased phosphorus runoff, but also excessive inputs of other pollutants such as nitrogen and herbicides/pesticides. In Table 10-6 (p.10-29), why are only phosphorus data included, and not monitoring data for nitrogen, suspended solids, and herbicide/pesticides?*

Response: These sites are for monitoring phosphorus only. The objective of this monitoring effort is to identify high phosphorus source areas in support of District regulatory efforts, state tributary TMDL efforts, and the FDAC BMP program. However, the District monitors these parameters through the ambient monitoring network. These data will be reported in the 2008 SFER.

***Comment**: Nitrogen is an important nutrient influencing algal growth. Once light limitation is relieved, the water-column TN: TP ratio (see Table 10-7) is important for the appearance of blue-green algae, including toxic species.*

Response: Agreed. Previous research indicated that in areas of the Lake that were not light-limited, algae were typically nitrogen-limited (Aldridge et al., 1995).

Comment: *What were the concentrations of organic contaminants (herbicides, pesticides) in the runoff?*

Response: Pesticides are monitored quarterly at sites throughout South Florida. Quarterly reports are presented at the District website (www.sfwmd.gov) under the *What We Do, Environmental Monitoring, Reports* section. The last report available did not show any pesticides in inflowing waters to Lake Okeechobee.

RESPONSES TO SEDIMENT MANAGEMENT COMMENTS

Comment: *Suspended sediment loading/resuspension was described as a major, potentially long-term impact of the hurricanes on Lake Okeechobee. How long is it projected that this problem will continue, and what models were used to make this projection?*

Response: The Lake Okeechobee Environment Model projects the impacts of hurricanes over short time scales (months). The Lake Okeechobee Water Quality Model can be used to project these impacts over longer time periods (30–100 years); however the settling, resuspension, and depth of active sediment layer must be defined. Based on current observations, it appears that the Lake is recovering. If the trend continues (i.e., no additional hurricanes and low water levels), we can hope for a full recovery within a few years, if not sooner.

Comment: *Despite the knowledge that the lake response to load reductions will be slow, little information was included about the feasibility of sediment management as an option for accelerating changes in water quality in the lake. In the Sept. 2006 Workshop, it was explained that the feasibility of sediment removal was examined and the cost was found to be prohibitive, but this information was not clarified in the chapter.*

Response: Information provided in the 2006 SFER is resummarized in the final version of the chapter.

RESPONSES TO FLORA AND FAUNA COMMENTS

Comment: *First, what is the overall extent of the exotic species problem in the Lake, and how does it compare with pre-hurricane years?*

Response: The authors do not routinely track exotic animals on the Lake, and exotic plant tracking is limited to torpedograss *(Panicum repens)* and Melaleuca (*Melaleuca quinquenervia*). Melaleuca is now totally controlled on the Lake and annual treatments are aimed primarily at seedling control. The torpedograss population on the Lake currently stands at approximately 16,000 acres. Five thousand acres were treated in 2004 and 5,000 more in 2005. Torpedograss control is at least keeping up with, and may be gaining on, the rate of spread (see notes on exotics mapping below).

To the authors' knowledge, the hurricanes of 2004 and 2005 appear to have had minimal impact on either Melaleuca or torpedograss.

Comment: *Second, what is the potential influence of herbicide/ pesticide applications on desirable flora and fauna?*

Response: Pesticides are not used on the Lake as part of any control program by SFWMD. The authors have no data on the direct effects of herbicides on Lake fauna. In the past, they have seen some negative effects on buttonbush when treating torpedograss in mixed stands; however, this problem has been largely resolved by treating these stands in winter, during the period of buttonbush dormancy. The authors are also investigating potential negative impacts on bulrush of spraying water hyacinth in bulrush stands. Overall however, exotic vegetation control activities tend to result in improvements in littoral zone plant community structure which has important indirect benefits to Lake Okeechobee wildlife.

Comment: *The high water levels and high suspended sediments after the hurricanes in 2004 and 2005 caused extreme hydrologic shifts and reduced light availability in near-shore and littoral zones that led, in turn, to a significant decline of submersed aquatic vegetation (SAV). However, the desirable water clarity target for SAV recovery was not clarified.*

Response: Since light availability for SAV growth is dependent on a combination of water transparency and Lake stage, the target is defined as a Secchi Depth to Total Depth Ratio of 0.5 meter or greater, a value at which it is generally agreed that the photic zone extends clear to the Lake bottom. This metric is typically applied on a site-specific basis, because bathymetry and water transparency vary spatially throughout the Lake.

Comment: *Fish populations are not only important aquatic resources, but may also directly and indirectly control phytoplankton growth. Fish received little attention in this chapter, such as impacts of planktivorous fish on the lake food web following the hurricanes. Once the lake begins to clear, high biomass of planktivorous fish could reduce water clarity by decreasing zooplankton biomass, resulting in an increase in phytoplankton.*

Response: The District recently contracted to perform fish surveys by trawl and electrofishing on Lake Okeechobee twice each year. The data presented in this year's report was a summary of what was available at the time the report was prepared. Currently, it is believed that all fish stocks on the Lake are very low. SFWMD is aware of the potential role of planktivorous fish in top-down control of phytoplankton populations, and is partnering with the St. Johns River Water Management District in a 3-year study to evaluate the impacts of shad (*Alosa* spp.) and shad removal on Lake nutrient dynamics.

RESPONSE TO WATER QUALITY MODELING COMMENTS

Comment: *Very little summary background information was provided about modeling approaches used for Lake Okeechobee. The modeling results were described to indicate that the hurricanes will have long-term impacts on the sediment transport, sediment resuspension, and nutrient exchange between the lake "bed" (bottom sediments) and the water column. Do the models being used to project long-term responses of the lake include provision for a dynamic sedimentation coefficient, and possible interactions with declining calcium and increasing sulfate? This seems a potentially important point with respect to long-term prospects for restoring the Lake.*

Response: A short section on modeling has been added to answer the questions in this comment.

RESPONSES TO RECOMMENDATIONS

Comment: *This chapter should include additional data from the monitoring program for inputs of suspended solids, nitrogen (inorganic and organic forms), sulfate, and herbicides/pesticides to Lake Okeechobee.*

Response: Nitrogen and TSS budgets can be provided (given enough time). Sulfate does not appear to be a problem and will not likely be investigated. Herbicides and pesticides are monitored quarterly and over a small network. Quarterly reports are presented at the District website (www.sfwmd.gov) under the *What We Do, Environmental Monitoring, Reports* section.

Comment: *The models being used to forecast eutrophication and recovery of Lake Okeechobee from hurricanes should be briefly described, including information about incorporation of changing sedimentation coefficients and internal phosphorus loading.*

Response: Revised.

Comment: *Research is needed on sulfate reduction in the Lake and its role in mobilizing phosphate, as a potentially important biogeochemical process influencing phosphorus availability and eutrophication.*

Response: As developed in the revised text, sulfate concentrations have declined by over 50 percent in the last 30 years. This decline is consistent with the decline in other ions in the Lake. Therefore, sulfate is probably not a large concern in the eutrophication of Lake Okeechobee.

Comment: *A description should be added about the extent of residual soil phosphorus accumulation in the watershed, the projected influence of this problem on the Lake's water quality, and the model(s) used to make this projection.*

Response: Such a project is being considered and may be included in FY2008.

Comment: *Information should be added about the severe suspended sediment problem in the Lake, the model(s) used to make this projection, and the analysis of feasibility for sediment management to accelerate improvements in water quality.*

Response: Information was added.

Comment: *Influences of fish on the lake food web should be examined.*

Response: In fall 2006, the District initiated a multi-year study to identify fish, macroinvertebrate, and amphibian associations with various submerged and emergent plant communities on Lake Okeechobee. It is anticipated that this work will eventually lead to food chain dynamics studies in key Lake habitats.

Comment: *Additional information should be included about exotic species in the Lake (for example, maps of major exotic species distributions, and descriptions of potential impacts on beneficial native species).*

Response: Detailed vegetation maps of exotic and invasive species in the Lake Okeechobee marsh are now being produced by digital aerial photography approximately once every 2 to 3 years; however, the time lag involved in producing these maps is on the order of 1 to 2 years. The 2008 SFER will contain completed maps for WY2003 and WY2006 exotic and invasive plant surveys. The District recently completed a trophic level study comparing torpedograss to native spike rush (*Eleocharis* spp.) habitat in the Lake's littoral zone and the results of this study will be presented in the 2008 SFER. SFWMD also has begun to investigate, in a quantitative fashion, the successional effects of torpedograss control on the emergent marsh community. Results will likewise be presented in the 2008 SFER.

Comment: *The Panel recommends, as in its review of the 2006 SFER, that this chapter provide more integration with other chapters. The Kissimmee River is a major source of water and chemical constituents to the Lake, which in turn supplies water and materials to the EPA, the St. Lucie Estuary, and the Caloosahatchee Estuary. The impacts of the upper watershed on the Lake, and of the Lake on the St. Lucie and Caloosahatchee Estuaries and the EPA, should be described. The chapter should also include a description of plans to account for potential impacts on the Lake from urban/suburban development affecting the upper watershed.*

Response: Integration has been added regarding the influence of the Kissimmee River on Lake Okeechobee and the influence of Lake Okeechobee Discharges to the St. Lucie and Caloosahatchee estuaries. The plans to account for urban/suburban development in the Upper Kissimmee watershed are included within Lake Okeechobee Protection Plan (LOPP).

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RESPONSES TO COMMENTS ON CHAPTER 11

Gary Williams and Steve Bousquin
with Chapter Co-Authors

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment: *Chapter 11 of the 2007 SFER should be restructured to add an initial outline of the chapter's contents.*

Response: Please note that electronic versions of all final 2007 SFER chapters, including Chapter 11, contain a bookmarked Table of Contents for all chapter-specific headings.

Comment: *The description of hurricane effects should include information about how such impacts can be mitigated.*

Response: Hurricanes are a recurring event in South Florida and have passed over the Kissimmee Basin with a frequency of about once every seven years on average for the last 129 years. The impacts of hurricanes can be mitigated primarily by increasing the storage capacity for the intense rainfall that can accompany hurricanes and other tropical systems. In the Kissimmee Basin, storage is increased in several ways. First, regulation schedules for lakes are designed to lower water levels and increase water storage capacity for the wet/hurricane season. Second, the Headwaters Revitalization Project, when complete, will provide an additional 100,000 ac-ft of storage in lakes Kissimmee, Cypress, and Hatchineha. Third, future CERP projects will provide additional storage of Kissimmee Basin water before it enters Lake Okeechobee.

Comment: *Explanation should be added about considerations to ensure that restoration provides sufficient nesting sites for colony occupation by wading birds.*

Response: Anecdotal observations within the Phase I area suggest that ample woody shrub vegetation exists for nesting. A vegetation mapping project of the Kissimmee River and floodplain is nearly complete and will provide quantitative information regarding the amounts and locations of suitable nesting sites for wading birds. Prior to implementation of the Headwaters Revitalization regulation schedule, timing and depth of floodplain inundation may be less than optimal for wading bird nesting colonies. Chapter text will be modified to clarify these points.

Comment: *The use of data on dissolved oxygen sags in the PM for that parameter should be clarified, and the extent to which dissolved oxygen sags promote higher phosphorus release from sediments should be examined.*

Response: To clarify dissolved oxygen monitoring, there are two stations within the river channel that monitor dissolved oxygen every 15 minutes. These data are used to determine dissolved oxygen sags. Additionally, when conditions are such that there is a high probability for a

dissolved oxygen sag (wet season, low flow, and so on), additional sensors are deployed near the river channel bottom so that the entire water column is sampled.

Comment: *Increased phosphorus levels at the southern end of Lake Kissimmee are, as yet, unexplained and could confound management goals. The steps being taken to identify the sources of this elevated phosphorus should be clarified, and progress assessed in the 2008 SFER. A Ph target should be added to the restoration expectations.*

Response: As suggested, efforts to identify sources of elevated phosphorus will be clarified in the 2008 SFER chapter. There are no plans to add a phosphorus expectation to the Kissimmee River Restoration Project (KRRP), because reference data are inadequate and the degree and timing of phosphorus loading reduction, if any, are uncertain. It should be noted that the KRRP was not designed for nutrient removal and any phosphorus decreases that result from the project will be coincidental to achieving the goal of restoring ecological integrity in the project area.

Comment: *The Kissimmee and its watershed are the headwater region for the Everglades and, as such, are of vital importance to Everglades system functioning. This chapter requires clarification of how adaptive management is applied to the Kissimmee River and upper watershed, and the extent to which management activities in the Kissimmee are integrated with management for the rest of the Everglades system. Clarification should include explanation of how the phosphorus and mercury information will be included as part of the overall Everglades evaluation of mercury contamination.*

Response: Control of phosphorus and mercury in the Kissimmee Basin is outside the scope of the projects reported in the Chapter 11 of this volume. The Kissimmee Division, Okeechobee Division, and Okeechobee Service Center have begun to collaborate on projects related to phosphorus release, assimilation, and transport in the Kissimmee River system. This proposed work would address objectives of the LOPP, LOER, Kissimmee Chain of Lakes work, Long-Term Management Plan, and KRRP. Future efforts to address mercury would have to result from collaboration among CERP/RECOVER and the Kissimmee Division, but no such efforts are currently planned. See the following comment for more information on KRRP adaptive management.

Comment: *The chapter discussion of adaptive management suggested a "moving management target". How can the general citizenry judge management progress toward goals if goals may have to be adapted (changed) in recognition of improved understanding? How will accountability of KRRP be evaluated? In response to this question, the chapter authors noted that "targets do not move". If not, then what does "adaptive management" mean for the Kissimmee system? – How is it defined, and how can it be implemented?*

Response: The KRREP definition of the term adaptive management does not imply a moving management target. Rather, it means adaptation of management strategies, based on current monitoring data, to achieve pre-established targets that have been determined using reference conditions. These targets are stated as restoration expectations in Volume II of the Kissimmee River Restoration studies (Anderson et al., 2005). For example, failure to meet a vegetation expectation with restored floodplain inundation alone may suggest a need for modification or addition of management actions, such as adjustment of water releases, prescribed burning, or control of aggressive invasive species.

Comment: *Hydrilla was only briefly mentioned (e.g., Table 11-5), and information about interactions between water level management and Hydrilla control was not included. How serious of a problem was Hydrilla abundance in WY2006, and what are expectations about its role in the KRRP?*

Response: Primary responsibilities for hydrilla (*Hydrilla verticillata*) are assessment and management within the SFWMD lie with the Vegetation Management Division. Hydrilla status is detailed in the Kissimmee module in Chapter 9 of this volume.

Comment: *A key element in evaluation of the KRRP is to assess the effects of restoration methods: that is, how does the methodology used in the restoration impact the system?*

Response: Construction impact assessment allows for the minimization or alleviation of any short-term or incidental environmental impacts occurring over the course of the construction phase. The impacts of construction on four water quality parameters [turbidity, total phosphorus (TP) flow-weighted concentration and load, and dissolved oxygen (DO) concentration] are quantified throughout construction. See 2005 SFER Kissimmee chapter for details.

RESPONSES TO ADDITIONAL COMMENTS

Comment: *Use of wading birds as an indicator is a sound approach because they integrate ecological conditions. The data presented indicate that restoration for foraging wading birds suggest that restoration is proceeding well, although it was unclear as to whether there are appropriate nesting sites for colony occupation.*

Response: This comment was addressed in previous responses. Clarification has been added to the chapter text (see *Responses to Peer-Review Panel Recommendations* section below).

Comment: *It was unclear as to whether dissolved oxygen sags (concentrations in dark periods) are considered as a PM (Table 11-1, and lines 632-637) of the KRREP, in addition to (or instead of) mean daytime concentrations. Have there been efforts to determine whether dissolved oxygen sags are associated with higher phosphorus release?*

Response:
DO sag clarification has been addressed (see *Responses to Peer-Review Panel Recommendations*). The effect of oxygen sags on phosphorus release from river sediment has not been examined. Compared to the amount of phosphorus transported downstream from sources throughout the basin, the authors believe the amount of phosphorus released from river channel sediment should be relatively minor, if not insignificant. However, this is only speculation. For the upcoming evaluation of Phase II/III of the restoration project, staff is discussing proposals to study phosphorus assimilation and release as wetlands are restored in the Pool D floodplain and flow is diverted to remnant channels. A statement to this effect has been added to the *Dissolved Oxygen* section in Chapter 11.

Comment: *What steps are being taken to identify the sources for increased P levels at the southern end of Lake Kissimmee (lines 782-783, 798-800)? The authors' response to this question was unclear.*

Response: Possible sources of the increased phosphorus levels are being investigated by the SFWMD and FDACS. Because existing data are inadequate for identifying these sources, they are not named in the report. The SFWMD and FDACS are attempting to establish additional stations for data collection. A statement has been added to the *Phosphorus* section of the Chapter 11 noting that efforts to identify sources of elevated phosphorus are expected to be clarified in the 2008 SFER.

Comment: *Hydrilla was only briefly mentioned (e.g., Table 11-5), and information about interactions between water level management and Hydrilla control was not included. How serious of a problem was Hydrilla abundance in WY2006, and what are expectations about its role in the KRRP?*

Response: This comment was addressed in previous responses.

Comment: *A key element in evaluation of the KRRP is to assess the effects of restoration methods: that is, how does the methodology used in the restoration impact the system?*

Response: This comment was addressed in previous responses.

Comment: *Will the mercury information for the Kissimmee system be included in the overall evaluation of mercury in the Everglades?*

Response: Mercury in largemouth bass *(Micropterus salmoides)* has been monitored by the FWC, but more extensive efforts to address mercury in the Kissimmee Basin would have to result from collaboration among CERP/RECOVER and the Kissimmee Division. No such efforts are currently in place.

Comment: *The chapter discussion of adaptive management suggested a "moving management target". How can the general citizenry judge management progress toward goals if goals may have to be adapted (changed) in recognition of improved understanding? How will accountability of KRRP be evaluated? In response to this question, the chapter authors noted that "targets do not move". If not, then what does "adaptive management" mean for the Kissimmee system? – How is it defined, and how can it be implemented?*

Response: The authors are unable to locate any suggestion of a "moving management target" in Chapter 11. The KRREP definition of adaptive management has been added on page 11-23 line 59. As defined in a previous response, adaptive management is the adjustment of management strategies based on data from an ongoing monitoring program. The data are used to learn about system responses to current management and to help identify changes in management that may be needed to meet project goals or targets; the management action may therefore be regarded as an experimental treatment which may be modified if needed to reach a stated goal. Modification of the goal is not implied. Over time, this approach can help to reduce uncertainty by a process of "learning by doing" (Walters and Holling, 1990). The definition is in general consistent with the very extensive literature on the topic of adaptive management. A very small selection from this literature includes Holling, 1978; Walters, 1986; Lee, 1993; and Habron, 2003.

Comment: *It was unclear as to how the management of the Kissimmee relates to management of the rest of the Everglades system. In what ways are the management options coordinated, and how do he actions in the Kissimmee affect Lake Okeechobee and the rest of the Everglades?*

Response: Clarification has been added to the chapter text (see *Responses to Peer-Review Panel Recommendations*).

Comment: *Is it possible to incorporate the water quality improvement goals of KRRP with the water quality data and information presented in Chapter 3 via graphs/maps showing water quality changes over all of South Florida? The discussion of KRRP suggests that data collected for other purposes are being used for KRRP evaluation purposes. Is this correct, or are data collected directly for KRRP purposes? If the former is the case, the panel is concerned about the consistency of data and information over time and space in tracking restoration progress.*

Response: (B. Jones) This question is not entirely clear, as Chapter 3 concerns the Everglades, not the whole South Florida region. The authors do recognize that there should be integration of the goals and monitoring results from different areas within the District. Chapter 1B attempts to integrate information from the entire District, including the Kissimmee Basin, with a focus on phosphorus. However, it should be noted that the KRRP was not designed to reduce nutrient loading. Therefore, it does not have a phosphorus reduction goal, even though the evaluation program has a water quality component. Furthermore, the chapter on KRRP discusses only the restoration project, the hydrologic modeling and assessment project, and the long-term management plan for the Kissimmee Chain of Lakes. It does not discuss phosphorus control programs in the Kissimmee Basin, as that information is presented in Chapter 10, which treats the LOPP.

Of the data analyzed for KRRP, some stations are sampled solely for KRRP (restored and remnant river channels and floodplain), and other stations are sampled for other purposes in addition to KRRP (C-38 canal). The stations sampled for other purposes are a critical part of the Lake Okeechobee watershed monitoring program and will continue to be monitored indefinitely.

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS

Recommendation 1. *Chapter 11 of the 2007 SFER should be restructured to add an initial outline of the chapter's contents.*

Response: Addressed by SFER editorial team in response to previous comments.

Recommendation 2. *The description of hurricane effects should include information about how such impacts can be mitigated.*

Response: Clarification has been added on page 11-10 line 279 in response to previous comments.

Recommendation 3: *Explanation should be added about considerations to ensure that restoration provides sufficient nesting sites for colony occupation by wading birds.*

Response: Clarification has been added on page 11-39 line 406.

Recommendation 4. *The use of data on dissolved oxygen sags in the PM for that parameter should be clarified, and the extent to which dissolved oxygen sags promote higher phosphorus release from sediments should be examined.*

Response: Text has been added to chapter at page 11-26 line 122. A statement of current plans to address phosphorus release also has been added to the DO discussion on page 11-27 line 157.

Recommendation 5. *Increased phosphorus levels at the southern end of Lake Kissimmee are, as yet, unexplained and could confound management goals. The steps being taken to identify the sources of this elevated phosphorus should be clarified, and progress assessed in the 2008 SFER. A Ph target should be added to the restoration expectations.*

Response: A statement has been added to the *Phosphorus* section of Chapter 11 (page 11-35 line 307) noting that efforts to identify sources of elevated phosphorus are expected to be be discussed in the 2008 SFER.

Recommendation 6a. *The Kissimmee and its watershed are the headwater region for the Everglades and, as such, are of vital importance to Everglades system functioning. This chapter requires clarification of how adaptive management is applied to the Kissimmee River and upper watershed, and the extent to which management activities in the Kissimmee are integrated with management for the rest of the Everglades system.*

Response: Clarification has been added on page 11-7, line 196.

Recommendation 6b. *Clarification above should include explanation of how the phosphorus and mercury information will be included as part of the overall Everglades evaluation of mercury contamination.*

Response: Phosphorus has been addressed in a response to one of the comments above. Mercury should be addressed in collaboration with researchers involved with CERP/RECOVER. No collaboration is planned at this time.

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RESPONSES TO COMMENTS ON CHAPTER 12

M. Patrick Gostel with Chapter Co-Authors

RESPONSE TO GENERAL COMMENTS ON EVOLUTION AND PROGRESS OF CHAPTER 12

Comment: *In consideration of the enormous scope of this chapter, the previous year's Review panel recommended that the writing be completely restructured to focus in depth on one coastal ecosystem per year while succinctly summarizing goals and activities for that year in each of the other ecosystems. A more comprehensive overview was to be provided at five-year intervals. The authors were responsive to this counsel, but additional management and oversight in this chapter is needed. Consistency was lacking in a common presentation template that could be applied to the seven more briefly described systems, and the chapter did not clearly describe the District's main activities in each of Coastal Ecosystem during WY2006[….]Thus, although progress was made in streamlining the chapter, the panel views it as still a work in progress toward achieving appropriate structure and content.*

Response: District staff is in total agreement that the chapter is a work in progress. Additional work will be needed to create a template that more clearly and succinctly portrays the relevant data and information from one water year to the next. District staff resources are committed to make these changes for next year and the guidance provided by the panel will be used to better configure the chapter for consistency in format and information management. The panel's direction regarding the establishment of a common presentation template and increased use of consistent summary tables will be incorporated in the 2008 SFER chapter.

RESPONSES TO PANEL RECOMMENDATION COMMENTS

Comment 1: *The panel recommends inclusion of an overview in the Introduction of Chapter 12, with charts, tables and supporting text (as exemplified in Chapter 1A), to clarify the District's plan in managing the eight coastal ecosystems. Clarification of management strategies and quantifiable targets will allow the District to take greater advantage of opportunities to optimize use of estuaries as excellent "integrative natural barometers" in evaluating the overall success of watershed management activities. In addition, the Chapter should reflect consideration in the District's management approach (at least in an abbreviated way, through literature consulted) of efforts in other Gulf Coast and Atlantic states that have (i) developed, implemented and evaluated coastal zone management methodologies, and (ii) shown responsiveness to legislative mandates to determine freshwater inflow requirements into the future, in the face of competing municipal, industrial and irrigation uses of water.*

Response 1: District staff agrees with this comment. The literature cited in Chapter 12 is not representative of the literature citations contained in technical reports published by the District. It is recognized that there is considerable literature on both the effects of freshwater inflow in the structure and function of estuaries and on the management of flow to estuaries. In order to stay informed, the District commissions periodic literature reviews, sends staff to national scientific conferences, and encourages staff to publish through the peer-reviewed literature process.

Staff knowledge of and attention to scientific work on estuaries outside of Florida are reflected in the technical documents produced to support restoration planning, minimum flows and levels, and water reservations rule development, and are reflected in the technical appendices to the SFER. District staff will redouble efforts to ensure that all appropriate and pertinent studies are taken into consideration and are referenced in future technical reports.

Comment 2: *The panel recommends that the District continue to develop plans to take advantage of opportunities to coordinate work on South Florida's estuaries.*

Response 2: District staff currently is involved in extensive coastal watershed coordination with other agencies, research institutions, and stakeholders. Much of this effort is required and documented through the CERP processes and various other state and federal cooperative agreements. District staff will continue to seek opportunities for collaboration and make efforts to document these collaboration activities.

Comment 3: *The panel recommends adoption of a common presentation template for each of the Coastal Ecosystems, including identification of major issues within each, summary information on the explicit restoration goals (in numerical terms where possible) and supporting rationale, invasive species, and a table of information on lead and collaborating agencies' activities (new projects/progress, and continuing projects/ progress).*

Response 3: A common template will be developed for next year's report. As a part of this development process, the authors will review and compile existing information in a more integrated manner, where that information is available.

Comment 4: *The panel recommends inclusion of a separate section on EACs and VECs following the Introduction, including clarification by ecosystem of where these criteria have been developed/planned/in progress. This section should include brief definitions and rationale for selection of the targeted VECs, and tables of the range of environmental conditions where the indicator species occur, thrive, and are stressed (e.g., including salinity, nutrients [TP, inorganic N forms, TN], and light for seagrasses and the freshwater/brackish species, Vallisneria americana; salinity and dissolved oxygen for eastern oysters). Published descriptions of data from other states that border the Gulf of Mexico and the Atlantic should also be considered in modifying the summary tables, e.g., for freshwater inflow requirements for commercial and other valued species of finfish and shellfish, salinity tolerances and optima, and water quality modeling to determine freshwater flows needed to meet those optima.*

Response 4: The authors will consider the implementation of this recommendation as a part of the development process for the 2008 SFER chapter.

Comment 5: *The panel recommends that this chapter contain tables/diagrams that summarize the main programs, entities, and integrative efforts involved in the coastal ecosystem of focus (for WY2006, the Loxahatchee restoration effort). The map of the coastal ecosystems should further clarify the boundaries of each.*

Response 5: The authors plan to incorporate more tables/diagrams relative to the coastal ecosystem of focus in the development of the 2008 SFER chapter, review the opportunities for incorporating this into the chapter, and revise the map of the coastal ecosystems in the current document.

Comment 6: *The panel recommends strengthened consideration of water quality data collection (parameters, frequency of sampling) at key or core stations in each coastal ecosystem, and clarification of how water quality data other than salinity will be incorporated into modeling efforts to understand and predict restoration success. Certain parameters, such as inorganic nitrogen, can contribute to the degradation of these coastal ecosystems and compromise their recovery even when problems with hydrology can be corrected.*

Response 6: The authors will consider the implementation of this recommendation as a part of the development process for the 2008 SFER chapter.

Comment 7: *The panel recommends that for coastal ecosystems in highly urbanized areas, the District should encourage development of a plan to examine the history of eutrophication (e.g., via examination of sediment cores), and a plan to examine the history of toxic substance accumulations in the sediments and impacts on the benthic food webs.*

Response 7: These highly urbanized areas present a unique opportunity and challenge for integration of research efforts. The District is often not the lead agency involved in establishing priorities in these systems. Therefore, establishment of additional site-specific research is the result of a multiagency cooperative process, and highly dependent on developing consensus on priorities and the availability of funding and other resources.

Comment 8: *The panel recommends that additional insights be gained about the role of phosphorus in supporting the cyanobacteria bloom that developed in Biscayne/Florida Bays, by using the available data to assess (i) the mass of total phosphorus in the Sounds during the period of elevated total phosphorus concentrations; (ii) the mass of total phosphorus that could be derived from the cutting and mulching of mangrove trees, soil tilling and soil stabilization in the period immediately following the operation, to estimate the leaching potential; and (iii) the mass of total phosphorus that could have been released by the top 2-5 centimeters of the Sounds' sediments being resuspended and stirred by waves in these shallow systems when the hurricanes moved through. This information can be used, in turn, to assess which estimated total phosphorus mass better approximates the mass of total phosphorus that was empirically measured in the Sounds during the period of elevated total phosphorus concentrations.*

Response 8: These are good suggestions and some of the calculations (e.g., mass in mangrove trees) are currently being made. Studies of nutrient flux from disturbed soils are also planned. Fluxes from sediments during storms are difficult to estimate and may require use of a water quality model, which is in development as part of the Florida Bay and Florida Keys Feasibility Study.

Comment 9: *The panel recommends that exotic invasive species (major taxa and issues in the coastal ecosystems) be described in more detail in this chapter, considering that Chapter 9 emphasizes terrestrial and freshwater species. Exotic species represent a compelling major threat to the District's restoration efforts. As exemplified by the eastern oyster/green mussel situation in the coastal ecosystems, exotic estuarine/coastal marine species should be carefully considered in development of restoration management plans, including modeling efforts designed to evaluate performance measures for indicator species.*

Response 9: The authors agree that the potential impacts of exotic species are a concern in any coastal ecosystems restoration effort. The authors will discuss with the authors of Chapter 9 how best to approach this topic for future reports.

RESPONSES TO ADDITIONAL COMMENTS ON THE LOXAHATCHEE SECTION
(CONSIDERING INFORMATION FROM CHAPTER 12 AND APPENDIX 12-2)

Comment: *Missing from the Loxahatchee section in Chapter 12 was clarification, beyond the Northwest Fork, of how the District plans to address major issues for this Ecosystem – the important "next steps".*

Response: This was partially addressed in previous years, but the authors will add language to address "next steps" in the chapter.

Comment: *The monitoring frequency and number of sites for oysters, an important indicator, during WY2006 were not clarified in the chapter, and it was also unclear as to why a monitoring station apparently has not been included in the most extensive oyster bed (southern portion of the central island).*

Response: The authors plan to include data on the frequency and number of sites for oysters in the final 2007 SFER. Data on the oyster bed in the southern portion of the central island are expected to be available for the 2008 SFER.

Comment: *Flow gauges are operational apparently in only 7 of the 12 sub-basins of the Northwest Fork. This would seem to be a serious problem that would limit the planning and modeling for this system.*

Response: The area covered by the flow gauges covers approximately 70 percent of the watershed. The remainder of the watershed, or 30 percent, lies in the tidally influenced areas and there are some technical difficulties in measuring flow under these conditions. Flow from these tidally influenced areas is modeled using the calibrated basin with gauges. Most of the small basins were specifically delineated because they did not contribute to a gauge.

Comment: *The water quality monitoring also seems inadequate, considering that the Loxahatchee system was emphasized in District activities/reporting for WY2006, and that the District identified increasing inputs of nutrients and other pollutants as one of three major impacts on the coastal ecosystems. Many segments of the Loxahatchee system have been described as degraded by nutrient over-enrichment and other pollutants. For example, the aquatic preserves and JDSP are Outstanding Florida Waters and have the highest standards for protection of water quality. Yet, monitoring for various standard parameters (for example, nutrients) presently is sparse (more than 40 locations but bimonthly or less, depending upon the station). As another example, sediment loading to Cypress Creek and the Northwest Fork were identified as one of four major water resource problems, but there was no mention (in the chapter or appendices) as to whether/ where suspended sediments are monitored more frequently than bimonthly.*

Response: The District is working with the LRD to evaluate the existing water monitoring system. It is agreed that one of the ways to improve the data for analytic and modeling purposes is to increase data collection from bi-monthly to monthly.

Comment: *Mangroves were described as capable of surviving in freshwaters, so no declines in mangrove abundance were anticipated, but would mangroves be significantly stressed in such environments?*

Response: The stress for mangroves (*Rhizophora* spp.) in fresh water would not be from freshwater flows. However, the freshwater flows would increase the growth and propagation of freshwater species such as pond apple (*Annona glabra*), bald cypress (*Taxodium distichum*), and pop ash (*Fraxinus caroliniana*) that can also grow at similar elevations. In a century, the mangroves in the upper tidal reach may be reduced to the level of subcanopy, similar to the lower portion of Kitching Creek.

Comment: *Regarding effects of various parameters on larval fish density and species composition, what factors are being considered besides changing water levels and salinities?*

Response: The evaluation of historical ichthyoplankton data (1986–1988) provided justification to limit the window of time of the recent study to spring months, when tropical species most utilize the Loxahatchee estuary. This utilization during the spring was related to salinity and water depth, as well as sample location with associated hydrodynamic and adjacent critical habitat for juvenile-stage fishes.

Comment: *The District plans to collect water quality data to evaluate potential linkages with seagrass and macroalgal abundance. Will nutrients be included? Nutrients are known to be a major factor influencing both seagrasses and macroalgae.*

Response: The LRD has a long-established water quality monitoring program for the Loxahatchee River. Nutrients are included in the monitoring currently conducted. The District and LRD are evaluating the existing program to identify improvements for modeling and analytic purposes.

Comment: *A Digital Evaluation Model under development will provide details of micro-relief that are described as critical for determining water inundation in the floodplain area of the Northwest Fork. What are the District's expectations as to how this model will alter conclusions about optimal flows?*

Response: The existing LIDAR data cannot support the detail needed for the Digital Evaluation Model (DEM). This type of LIDAR data acquisition has unique specifications because of heavy tree canopy that covers the river channel and floodplain that is covered with dense ground cover. The project is scheduled for FY2007. Staff does not think that the DEM model will result in different conclusions about the optimal flows. However, it is anticipated that the more detailed information will provide a better understanding about the inundation and storage of water in the freshwater floodplain with respect to the habitat utilization of the floodplain.

Comment: *Because most emphasis has been directed toward balancing freshwater flows for improved growth of floodplain vegetation, the conditions created for the eastern oyster indicator are acknowledged as generally sub-optimal. How well will the selected flow regime (Appendix 12-2, p.8-20) approach the critical flow of 230 cfs needed for oysters at RM 4.13 (p.7-54)?*

Response: The critical flow of 230 cubic feet per second (cfs) at River Mile (RM) 4.13 is critical because the variable flows and resultant salinities associated with that alternative create a very

stressful salinity regime for oysters and therefore an unfavorable oyster habitat. According to the salinity evaluation criterion, the selected flow regime (LV90 TV60) will not stress oysters at RM 4.13, but will cause a minimal stress increase at RM 4.93 and a loss of oysters upstream of RM 4.93.

Comment: *The oyster indicator is an important indicator for the Loxahatchee, including the Restoration Plan for the Northwest Fork of the Loxahatchee River. Yet, Chapter 9 describes invasive green mussels as posing a serious threat to continued survival of the eastern oysters in the Loxahatchee as well as the St. Lucie and other estuaries. There is no mention in Chapter 12 or its appendices as to how this problem will be accounted for in evaluating PMs for oyster restoration.*

Response: The spread of exotics in South Florida estuaries is a legitimate concern that will have to be addressed in future restoration plans as District staff, in partnership with other agencies, develops additional science-based assessments.

RESPONSES TO ADDITIONAL COMMENTS ON OTHER COASTAL ESTUARIES

Comment: *The cyanobacteria bloom that developed in Biscayne/Florida Bays was discussed with respect to the relative impacts of road construction versus hurricanes on phosphorus and chlorophyll a concentrations. The data offer an opportunity for further evaluation of sources of phosphorus that supported the bloom.*

Response: See response to panel Recommendation 8 in the previous section, *Responses to Panel Recommendation Comments.*

Comment: *Although seagrasses are an important indicator targeted by the District for the St. Lucie Estuary, there is no salinity recorder for seagrass areas near the mouth of the estuary. Are there plans to add an instrument there?*

Response: The District is considering the installation of automatic salinity recorders at the seagrass sites near the St. Lucie Inlet, which is dependent on funding. However, several sources already support understanding salinity and salinity fluctuations at the referenced seagrass sites, including:

- Salinity taken during monthly seagrass monitoring (4 years of data)
- Salinity taken at nearby sites as part of the Indian River Lagoon Water Quality Monitoring Program (seven times per year)
- Data from automatic salinity recorders collected (1999–2003) from the Jensen Beach Causeway (7 km north of Site 2), St. Lucie Inlet (3 km south of Site 2, 1 km north of Site 3), and Peck's Lake (6 km south of Site 3)

Together with these data, a hydrodynamic salinity model can help predict salinity at the seagrass sites.

Comment: *Considering that the model for Florida Bay (lines 882-892) calculates nutrient flows, are nutrient flows factored into predicting seagrass abundance? The writing indicates that the model only focuses upon predicting effects of salinity on seagrasses. How are interactive effects of salinity and other variables considered? The 2006 SFER mentioned the Florida Keys; does the District plan to eventually include them for emphasis?*

Response: To date, the model has used forced inputs (not dynamic calculations) of water column nutrient concentrations, temperature, light, and salinity. All other inputs were held to average annual curves. However, SAV growth and biomass are affected by sedimentary nutrient availability. A fixed quantity of sedimentary nutrients is assumed as an initial condition. SAV uptake, detrital decomposition, and phosphorus sorption dictate subsequent availability. Salinity and nutrient limitation are assumed to be multiplicative attenuators of growth and this assumption is supported by experimental results. More information about the exact structure and capabilities of the model can be found in the report (Madden and MacDonald, 2006) referenced in the text. Resource impacts and restoration activities in the Florida Keys are appropriate topics for inclusion in future SFERs.

Comment: *Considering the large distance between stations 4 and 5 in the Caloosahatchee Estuary (p.12-45, Figure 12-27), should another station be added? Was hydroacoustic sampling of SAV conducted at site 4 and if not, why not (line 1105)? It is unclear if/when the inoperable Sanibel recorder in an important sampling site will be replaced (Figure 12-25).*

Response: While another station could be added, the spatial gap between stations 4 and 5 represents a real gap in the distribution of SAV in the Caloosahatchee. Station 4 is populated with freshwater SAV only after extended wet periods. Saltwater SAV has never been observed here. Station 5 is very near the upstream limit for persistent marine seagrass (*Halodule wrightii*). An occasional *Ruppia maritima* shoot may be found almost anywhere, but small persistent beds of *Ruppia* are located at the mouths of creeks in the upper estuary (upstream of Station 4).

Hydroacoustic sampling of SAV did not occur at Station 4. Station 4 was not sampled for two reasons. First, for statistical purposes, two sampling areas (reaches) were established in four regions of the system: Upper Estuary, Lower Estuary, San Carlos Bay and Pine Island Sound. Stations 1 and 2 served as the replicate reaches for the Upper Estuary. Second, SAV is only rarely found at Station 4 during prolonged wet periods.

Regarding the replacement of the Sanibel recorder, this is in the process of being replaced.

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATIONS AND ADDITIONAL COMMENTS AND QUESTIONS – APPENDIX 12-1

Refer to the relevant section in Part II of this appendix, *Responses to Comments on Special Review Topics.*

LITERATURE CITED

Madden, C.J. and A.A. McDonald. 2006. Technical Documentation for the Florida Bay Seagrass Community Model, Version 2.0. SFWMD Technical Report Series. USGS project Florida Bay Seagrass Model98HQAG2209. South Florida Water Management, West Palm Beach, FL. 66 pages.

2007 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 2007 SFER panel's Final Report (Appendix 1A-5) on appendices presented as special review topics in this year's SFER.

Volume I special review subjects include:

- Consideration of Long-Term Climatic Variation in SFWMD Planning and Operations
- Preliminary Assessment of Sulfur Sources, Trends, and Effects in the Everglades
- Calculation of Annual and Five-Year Geometric Mean Total Phosphorus Concentrations to Assess Compliance with the Phosphorus Criteria for the Everglades Protection Area
- Preliminary Report on the Riverine and Tidal Floodplain Vegetation of the Loxahatchee River and its Major Tributaries

RESPONSES TO COMMENTS ON APPENDIX 2-3[5]

Jayantha Obeysekera and Contributing Authors

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment: *The less than two-page section on climatic variability appears to be based on one reference - a draft paper presented in Appendix 2-2. Is this to be submitted to a peer reviewed journal for publication? Why there is one subtitle in this short section-is it necessary?*

Response: The authors of the appendix *Consideration of Long-Term Climatic Variation in SFWMD Planning and Operations* are not planning to submit the paper for a peer reviewed journal prior to the final release of the SFER 2007 report. They do acknowledge that key citations are from peer-reviewed journal publications.

[5] Draft Appendix 2-2 has been modified as Appendix 2-3 in the final 2007 SFER.

APPENDIX 3B-3: RESPONSES TO COMMENTS

Cynthia Gilmour[6] and Contributing Authors

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment: *Sulfate and the mercury problems in South Florida are closely related. The sulfate/mercury methylation relationship needs to be understood in order to manage the mercury problem in South Florida.*

Response: Agree.

Comment: *Sulfate may be the source of the problem, but sulfate is not the problem* per se. *It is sulfate reduction that affects mercury methylation, phosphorus and nitrogen mineralization, and plant growth.*

Response: The authors agree, and have tried to better emphasize that fact in the appendices. However, although microbial activity and Hg bioavailability are the mechanisms whereby sulfate contamination affects methylmercury (MeHg) production, the authors wish to emphasize that sulfate contamination is one of the dominant factors affecting MeHg production across the EPA.

Comment: *The sulfur problem in the Everglades should be studied considering the sulfate reduction and sulfide storage in the sediment, rather than considering only sulfate concentrations.*

Response: Over the past decade, the ACME team used a biogeochemical processed-based approach to understanding the controls on MeHg production, including the relationships between sulfate, sulfate reduction, and sulfide storage in sediments in various forms. Much of that data is available in the authors' publications and reports (see Bates, Orem, Gilmour and Krabbenhoft, and Marvin references in this volume's relevant appendices). However, of the parameters noted above, surface water sulfate is the most readily available. ACME mesocosm studies are being used to construct quantitative relationships for MeHg with surface water sulfate. These studies are being conducted with the best possible understanding of the processes in between sulfate load and MeHg production, so that key variables can be captured in models as they become more sophisticated.

The sulfate maps and trends presented in Appendix 3B-3 represent a synthesis of canal and marsh sulfate data from DBHYDRO and Aquatic Cycling of Mercury in the Everglades (ACME) preojct. This information can be used to apply the sulfate: MeHg relationships derived from ACME research studies across the EPA. Additional syntheses of soil sulfur data across the EPA are under way, and may improve models for change in MeHg with change in sulfate load or

[6] Smithsonian Environmental Research Center, Edgewater, MD

concentration. However, the data density for soil sulfur information is much less than for surface water sulfate.

Comment: *Porewater sulfide is only a small part of the sulfide storage in the system. The acid-volatile and chromium-reducible sulfides in the system are active in affecting mercury methylation and needs to be included in the study.*

Response: Agreed. The sulfur data summarization and mapping study presented in Appendix 3B-3 is only partially complete. Surface and pore water sulfide data were available from both ACME and DBHYDRO and were compiled and mapped in the initial phase of the study. ACME routinely measures acid-volatile sulfides (AVS), chromium-reducible sulfides (CRS), organic sulfur, and total reduced sulfur in soils, and these data will be compiled and mapped in the next phase of the project.

Comment: *Increase in sulfate concentration may or may not be the reason for increased mercury levels in fish. For example, mercury in fish is high in ENP but the sulfate concentrations are low.*

Response: As noted in the overview response (below), the authors believe there are clear field and experimental data linking changes in sulfate concentration or load to changes in MeHg production and bioaccumulation, for the Everglades, and for numerous other ecosystems. Some of that information is summarized in Chapter 3, and more details of the most recent ACME studies are now provided in Appendix 3B-2. The challenge now is to determine how important sulfate is as a driver ecosystem-wide. The key questions are: In what parts of the ecosystem would significant changes in MeHg in fish occur with a change in sulfate load? How much sulfate change would be required to make a significant change in MeHg in fish, and over what time period?

For ENP, specifically, there are areas where surface water sulfate concentrations are elevated. Appendix 3B-3 presents average surface water sulfate data for the available sites in the ENP (Map 2) and detailed surface water sulfate data for two sites in ENP, both in Taylor Slough (Fig. 14). The case is made that sulfate concentrations are elevated at the site near the L-67 canal terminus relative to more remote sites. However, there are relatively few sites where fish Hg data are collected in ENP. The authors agree that site-specific work examining the quantitative relationships between sulfate load and MeHg production for ENP would be valuable. To date, sulfate addition studies in mesocosms have mainly been conducted in central 3A15.

The sulfur isotopic ratio is not a good tracer for sulfur source in South Florida because of the large fractionation involved during sulfate reduction (Fig. 16)[…]The sulfate-to-chloride ratio and mass balance calculation of sulfur among consecutive reservoirs of Everglades…may provide useful information about the sulfate 'behavior'.

The authors disagree with this. Sulfur isotopes have been used successfully in a number of studies over many years to examine the source(s) of sulfate:

- Stam, A.C., M.J. Mitchell, H.R. Krouse, and J.S. Kahl. 1992. Stable sulfur isotopes of sulfate in precipitation and stream solutions in a northern hardwood watershed, *Water Resour. Res.*, 28: 231-236, 1992.
- Pichler T. 2005. $d^{34}S$ isotope values of dissolved sulfate (SO_4^{2-}) as a tracer for battery acid (H_2SO_4) contamination in groundwater. *Environmental Geology,* 47: 215-224.

- Adar, E. and R. Natic. 2003. Isotopes as tracers in a contaminated fractured chalk aquitard. *J. Contaminant Hydrology,* 65: 19–35.
- Sacks, L.A. 1996. Geochemical and isotopic composition of ground water with emphasis on sources of sulfate in the Upper Floridan Aquifer in Parts of Marion Sumter and Citrus Counties, Florida. Water-Resources Investigations Report 95–4251, U.S. Geological Survey, Tallahassee, FL.
- Sacks, L.A. and A.B. Tihansky. 1996. Geochemical and isotopic composition of ground water with emphasis on sources of sulfate in the Upper Floridan Aquifer and Intermediate Aquifer System in southwest Florida. Water-Resources Investigations Report 96–4146, U.S. Geological Survey, Tallahassee, FL.
- Sacks L.A., J.S. Herman and S.J. Kauffman. 1995. Controls on high sulfate concentrations in the Upper Floridan aquifer in southwest Florida. *Water Resour. Res.,* 31(10):2541–2551.
- And others…

While it is true that sulfur isotopically fractionates as a result of microbial sulfate reduction, it does so in a systematic fashion. For example, as one moves down the canals, sulfate concentrations gradually decrease and the sulfur isotopic composition of sulfate gradually increases (i.e., becomes heavier) due to microbial sulfate reduction preferentially removing the lighter fraction of the sulfate. By plotting sulfate concentration versus the sulfur isotopic composition of sulfate, a straight line emerges at higher concentrations indicating one major source, and with the highest concentrations having an isotopic composition of about +16 per mil (the same value as for agricultural sulfur and EAA soil containing agricultural sulfur). The scatter in sulfate versus sulfur isotopic composition at low sulfate compositions is a result of the fact that multiple sources of sulfate become important at low concentrations, where canal water sulfate no longer dominates.

If the reviewer means that sulfate/chloride ratios and mass balance calculations should be used *in addition* to the sulfur isotopes, then the authors agree, and indeed that already is being done. The sulfur isotopes represent just one piece of evidence, sulfate/chloride another, and sulfur mass balance another. At this point, all are pointing to agricultural use of sulfur as the major contributor to the observed sulfate contamination in the ecosystem. However, the authors will continue to evaluate new data as it becomes available, and could change this view if new contradictory data emerge. None has yet appeared, however.

Comment: *Sulfate concentration [alone] is not a good indicator for the mercury methylation problem. Other indicators of Hg methylation problem needs to be developed for management purpose…. Indicators of the mercury methylation problem other than sulfate concentrations should be developed for management purpose.*

Response: Research to date is insufficient to indicate whether surface sulfate alone is a good predictor of MeHg in fish across the Everglades. The surface water sulfate data compilation presented here is one step toward making that assessment. The authors agree that other factors probably need to be included to make adequate predictive models for MeHg across the Everglades. However, as outlined above, the authors believe that the data are clear that sulfate affects MeHg production rates in this ecosystem. Therefore, research on sulfate loads and trends are critical to managing the Hg problem in the Everglades. Other dominant drivers are Hg and dissolved organic matter (DOM), both of which have been subjects of intensive research within the ACME program.

A strategy for long-term monitoring of Hg in ecosystems is laid out in Mason et al. (2005) and in an upcoming Society for Environmental Toxicology and Chemistry book (Harris et al., 2006). The authors recommend monitoring strategies that include indicators of the biogeochemical processes that affect Hg methylation and bioaccumulation, including sulfur. Sulfate impacts on MeHg production have been demonstrated in many freshwater ecosystems, as discussed in this section from Munthe's new review paper (in press) on the links between Hg deposition and Hg in fish:

> The Hg and S cycles are intimately linked, thus linking acid rain to the Hg cycle. The balance between sulfate and sulfide is a key control on Hg net methylation rate in many ecosystems. Sulfate stimulates Hg-methylating sulfate reducing bacteria (SRB), while excess sulfide creates mercury complexes that are not bioavailable (Benoit et al. 1999a,b; Marvin-DiPasquale and Agee 2003). Sulfate-stimulation of methylation has been demonstrated in studies that range from pure culture (King et al. 2000; Benoit et al. 1999a,b), to sediment and soil amendments (Compeau and Bartha 1985; Gilmour et al. 1992; Harmon et al. 2004; King et al. 2001; Benoit et al. 2003), to field amendments to lakes and wetlands (Watras et al. 1994; Branfireun et al. 1999; Benoit et al. 2003: Jeremiason et al. 2006). Among these studies, the optimal concentration for methylation ranges from 10 to about 300 uM sulfate, while the optimal sulfide concentration is quite low, about 10 uM. Factors such as iron and organic matter concentration that impact Hg and S complexation change these optima. Sulfate, along with pH and DOC, has been identified as a parameter that relates to Hg levels in fish among water bodies (ie. Wiener et al. 2006).

References associated with the Munthe paper include:

- Benoit, J., C. Gilmour, A. Heyes, R.P. Mason and C. Miller. 2003. Geochemical and Biological Controls Over Methylmercury Production and Degradation in Aquatic Ecosystems. Y. Chai and O.C. Braids, Eds. In: *Biogeochemistry of Environmentally Important Trace Elements*, ACS Symposium Series #835, American Chemical Society, Washington, DC. pp. 262-297.

- Benoit, J.M., C. Gilmour, R.P. Mason and A. Heyes. 1999. Sulfide Controls on Mercury Speciation and Bioavailability in Sediment Pore Waters. *Environ Sci. Technol*., 33: 951-957.

- Branfireun, B.A., N.T. Roulet, C.A. Kelly and J.W.M. Rudd. 1999. In Situ Sulphate Stimulation of Mercury Methylation in a Boreal Peatland: Toward a Link Between Acid Rain and Methylmercury Contamination in Remote Environments. *Global Biogeochemical Cycles,* 13: 743-750.

- Compeau, G. and R. Bartha. 1985. Sulfate-Reducing Bacteria: Principle Methylators Of Mercury in Anoxic Estuarine Sediment . *Appl. Environ. Microbiol.,* 50: 498-502.

- Gilmour, C.C., E.A. Henry and R. Mitchell. 1992. Sulfate stimulation of mercury methylation in freshwater sediments. *Environ. Sci. Technol.,* 26: 2281-2287.

- Harmon, S.M., J.K. King, J.B. Gladden et al. 2004. Methylmercury Formation in a Wetland Mesocosm Amended with Sulphate. *Environ. Sci. Technol.,* 38: 650-656.

- Jeremiason, J.D., D. Engrstrom, E.B. Swain, E.R. Nater, B. Johnson, J. E. Almedinger, B. Monson and R. Kolka. Sulfate Addition Increases Methylmercury Production in an Experimental Wetland. *Environ. Sci. Technol.,* 40: 3800-3806

- King, J.K., J.E. Kostka, M.E. Frischer and F.M. Saunders. 2000. Sulphate-Reducing Bacteria Methylate Mercury at Variable Rates in Pure Culture and in Marine Sediments. *Appl. Environ. Microbiol.,* 66: 2430-2437.

- King, J.K., J.E. Kostka, M.E. Frischer, F.M. Saunders and R.A. Jahnke. 2001. Quantitative Relationship That Demonstrates Mercury Methylation Rates in Marine Sediments Are Based on the Community Composition and Activity of Sulphate-Reducing Bacteria. *Environ. Sci. Technol.,* 35(12): 2491-2496.
- Marvin-DiPasqule, M. and J.L. Agge, 2003. Microbial Mercury Cycling in Sediments of the San Francisco Bay-Delta. *Estuaries,* 26: 1517-1528.
- Watras, C.J. et al. 1994. Sources and fates of mercury and methylmercury in Wisconsin Lakes. C.J. Watras and J.W. Huckabee, eds. In: *Mercury Pollution: Intergration and Synthesis.* Lewis Publishers, Boca Raton. pp. 153-177.
- Wiener, J.G., B.C. Knights, M.B. Sandheinrich, J.D. Jeremiason, M.E. Brigham, D.R. Engstrom, L.G. Woodruff, W.F. Cannon and S.J. Balogh. 2006. Mercury in Soils, Lakes, and Fish in Voyageurs National Park (Minnesota): Importance of Atmospheric Deposition and Ecosystem Factors. *Environ. Sci. Technol.*, 40(20): 6261-6268. (Article) DOI: 10.1021/es060822h.

Comment: *[The panel recognized]… the importance of sulfur pollution in the Everglades is an important addition….[but did not find that the appendices provided clear support for links between sulfate and MeHg production; or sulfate impacts on plants].*

Response: Over the past decade, the ACME team has used an intensive, biogeochemical process-based approach to understanding the controls on MeHg production, studying many potential variables. Those studies indicated that mercury, sulfur, and DOM are the three most important biogeochemical controls on MeHg production and bioaccumulation in the Everglades ecosystem, based on spatial patterns of processes, laboratory and field experiments. Results of these studies are summarized in Chapter 3B of this volume and can be found in publications and reports referenced therein.

The 2007 SFER appendices 3B-2 and 3B-3 were not written to summarize that information, but to convey specific new information. Appendix 3B-2 was written as an update on the recent research on Hg cycling in the Everglades by the ACME team. In Appendix 3B-3, the authors are working to translate the biogeochemical relationships that ACME developed for long-term intensive biogeochemical studies, to the larger EPA. Specifically, Appendix 3B-3 presents the initial phases of a study of the sources and distribution of sulfate within the EPA, undertaken by the authors with support from the SFWMD, using long-term datasets from both the SFWMD and the ACME project. To begin, the authors examined the temporal and spatial trends in surface water sulfate concentration, since sulfate is the parameter for which the most information in time and space is available. In the next phases of this study, compilation of sulfur in various forms in soils will be made, and relationships between sulfate load and sulfur retention in soils examined. However, far fewer data are available for sulfur in soils. Appendix 3B-3 also included data from an FDEP-supported mesocosm study of the impacts of sulfate on EPA plant communities.

In the revisions to these two appendices, the authors have tried to clarify their content and intent, as noted above, and to better reference prior data upon which current research is based.

Further, additional data have been added to the appendices in response to review comments. Specifically, in Appendix 3B-3, the presentation of the study on sulfur toxicity to plants has been revised and expanded, and the sulfate and sulfide levels used in the study put into context with levels in the EPA.

Overall, the authors believe there are clear field and experimental data linking changes in sulfate concentration or load to changes in MeHg production and bioaccumulation, both for the

Everglades and for numerous other ecosystems. An effort has been made to capture that connection better in the appendices. The authors believe that the state of the art lies in applying those relationships across the EPA, modeling the effects of sulfate in combination with other biogeochemical parameters (e.g., Hg, DOM, and dry and rewetting cycles), and understanding how spatial and temporal patterns in sulfate in the EPA may effect MeHg production and bioaccumulation.

The comments in the summary panel review of Appendix 3B did not reflect all of the individual comments of the review panel. Individual reviewer comments on both Appendix 3B-2 and 3B-3 recognized the relationship between sulfur and MeHg, a relationship that has been discussed in the SFER, and in the scientific literature, over many years.

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Munthe, J., R.A. Bodaly, B. Branfireun, C.T. Driscoll, C. Gilmour, R. Harris, M. Horvat, M. Lucotte and O. Malm. Recovery of Mercury-Contaminated Fisheries. In press, Ambio.

APPENDIX 3C-1: RESPONSES TO COMMENTS

Grover Payne and Kenneth Weaver

RESPONSES TO PEER-REVIEW PANEL COMMENTS

Comment: *It seems unfortunate that the rule (which has been approved by both the ERC and U.S. EPA), based upon the brief description in the Appendix, accepts a minimum annual data requirement of six valid temporally independent TP measurements per year (p.2, para. 1 - thus allowing a weakening of a monthly dataset to a bimonthly dataset, and substantial loss of information). It is also unfortunate that the rule accepts as adequate collection of just 1 sample during the wet or dry season. Thus, hypothetically, 5 samples could be collected during a dry season, giving a potentially and artificially skewed (favorably low) picture of TP concentrations in the general absence of most non-point inputs, along with only 1 sample in the wet season.*

Response: The comment appears to reflect a misconception concerning the phosphorus criterion monitoring that will be conducted. Samples will be collected monthly except when conditions (e.g., marsh dry-out) prohibit the collection of samples. The minimum of six samples was statistically derived based on expected variability to specify the number of samples required to characterize the ambient conditions at a site during the year.

Comment: *Also, the rule does not allow sites designated as unimpacted to be converted to impacted sites – only conversions of impacted to unimpacted are considered. The District and partners are working to restore ecological integrity in South Florida, within constraints imposed by increasing, rapid urbanization in or adjacent to many parts of the area and associated impacts on water quality. While the major trend will be from impacted to unimpacted, the reality is that the opposite will occur/is occurring, as well, in some waters.*

Response: Correct, it is understood that some of the currently unimpacted sites may trend toward being impacted during the recovery process. However, if the rule allowed the conversion of unimpacted sites to impacted, that would automatically result in the unimpacted area achieving the criteria every year. The rule as stated is intended to promote continued improvement throughout each portion of the EPA.

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

Response: Normally, monitoring is to be conducted monthly. As specified in lines 43–45, if samples are collected fewer than 14 days apart, the median of the values is used in the calculations. If the samples are collected 14 or more days apart, the samples are treated as independent samples and all individual results are used in the calculations. As specified above, the minimum number of samples required for a site to be included in the phosphorus criterion assessment is six.

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

Response: The five-year network geometric mean is calculated as the arithmetic mean of the annual individual site geometric means computed during the five-year period. The six-sample minimum applies to all portions of the four-part test equally. In other words, if a site has fewer than six samples during the year, the site is not included in any of the computations for that year.

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

Response: The phosphorus criterion and the methodology presented in this chapter and appendix apply only to the EPA. Currently, the state's narrative nutrient criterion applies to the other portions of South Florida. The FDEP is currently working to develop numeric nutrient criteria that will apply to other portions of the state.

Comment: *The reason for designating monitoring sites either 'impacted' or 'unimpacted' is not clear. One can infer that the desire to so designate monitoring sites stems from a desire to determine, in some fashion, how much of the Everglades can be declared 'recovered'. In Chapter 3-C (page 3C-11, lines 368-370) there is a statement that counters the ability to identify the percentage of the Everglades exceeding the TP criterion: "…as the monitoring sites are unevenly distributed across the EPA, it is impractical to estimate accurately the percentage of the marsh exceeding a TP concentration of 10 µg/L based on these results." Thus, the question arises, what is the purpose of designating sites 'impacted' or 'unimpacted' if the design of the monitoring system does not permit this designation to have scientifically sound spatial meaning? Is this designation of sampling sites required in the law?*

Response: The Everglades Forever Act specifies that the criteria will result in net improvement of the impacted areas and prevent the unimpacted areas from becoming impacted. In addition, the phosphorus criterion rule also contains information regarding permitting discharges within the EPA. The permitting requirements are different if the discharge is to an unimpacted area versus one going to an impacted area.

Comment: *Some fundamental information should be added to this succinct appendix: Geometric mean should be defined, including explanation of how it differs from an arithmetic mean, and explanation as to why geometric means were selected for use, including appropriate references. A description of the four-part test (methodology) specified by the phosphorus criterion rule (62-302.540, FL Admin. Code) should be included. Clarification should also be added as to how unimpacted-to-impacted situations are addressed.*

Response: The appendix is not meant to be a stand-alone document. It is intended to be a supplement to the main chapter (3C) and the phosphorus criterion rule, which provide much of the basic information requested. The underlying fundamental information will not be repeated in the appendix.

Comment: *The descriptions of the calculation procedures for the various geometric means need more clarification including, if possible, addition of an equation for each geometric mean being computed?*

Response: Clarification will be added where appropriate.

Comment: *The data available for the phosphorus criterion rule need to be more consistent and comparable over time and space. Perhaps the monitoring program, currently under development, will resolve these issues.*

Response: As described above, the comments regarding the inconsistencies in the data being used in this chapter arise from misconceptions regarding the monitoring programs being conducted. The phosphorus criterion monitoring program will provide an even more consistent basis for future assessments.

APPENDIX 12-1: RESPONSES TO COMMENTS

Marion Hedgepeth with Chapter Co-Authors

RESPONSES TO PEER-REVIEW PANEL RECOMMENDATION COMMENTS

Comment 1: *The panel recommends that the Appendix should be restructured to include a background study area description and methods information within one section. A glossary of acronyms should also be added. A table summarizing information on historical studies should be added.*

Response 1: Recognizing that this is a preliminary report, the staff agrees that the appendix needs to be restructured, with additional material and clarification in the discussion and conclusion section. The authors also will evaluate further the content of the history background discussion. The final report will not be finalized until after the March 2007 publication of the 2006 SFER.

Comment 2: *The panel recommends that explanation should be added to address how the District plans to resolve the identified major enhancement and restoration issues for the Loxahatchee.*

Response 2: Additional clarification will be added.

Comment 3: *The panel recommends that PC-ORD and other tools for community analysis be applied to the dataset to gain further insights about factors controlling species groupings and community structure, such as TWINSPAN (two-way indicator species analysis), DECORANA (detrended correspondence analysis), and CLUSTR (cluster analysis).*

Response 3: Prior to the creation of forest types and indicator species specific to the Loxahatchee River, Twin Span (two-way indicator analysis) was used to analyze the vegetation data from the 1993/1994 Ward and Robert's Study (Transects 1 through 6). Based on this analysis, the forest types were determined using Relative Basal Area (RBA) and indicator species for each forest type. The authors anticipate performing Principal Component Analysis with the 2003 data and adding more environmental parameters (e.g., soil type and elevation) to the multivariate analysis to allow a more detailed analysis of floodplain community structure. The additional statistical analysis, however, will appear in a later report.

Comment 4: *The panel recommends that explanation should be added about how ranks and importance values were calculated, since these evaluations are critical components of the study.*

Response 4: The ten top canopy species were ranked by their percent abundance, basal area, and frequency of occurrence. Once all three categories were ranked, the ranks were summed for a total rank by species. An importance factor was developed by then re-ranking the total ranks of each species. A more detailed explanation will be provided in the final report.

Comment 5: *The panel recommends that supporting rationale should be added for certain information, such as measurement of only one to a few individuals within a population for dbh, the basis for the planned sampling frequencies for canopy communities and groundcover/shrubs, and omission of mention of submersed aquatic vegetation.*

Response 5: Within the 138 plots, all canopy species, that is, trees greater than 5 cm in diameter at breast height (dbh), were measured for dbh in the 2003 study. Canopy tree height data were collected randomly. The dbh of the canopy trees were re-measured in 2005 during the hurricane damage assessment survey and will be re-measured in 2009. A more detailed explanation will be provided in the final report.

Comment 6: *The panel recommends addition of a section that summarizes what was found about exotic and native invasive species, and what is known about their impacts on the floodplain plant communities of the Loxahatchee. This information is important in establishing the reference conditions.*

Response 6: The authors plan to include a summary table on exotic plants and expand the discussion on exotics based on information from Appendix D.

RESPONSES TO ADDITIONAL PANEL COMMENTS AND QUESTIONS

Comment: *The Executive Summary of the Appendix was unclear about how the vegetation study was conducted (major reaches considered, major vegetation types, determination of ranks and importance values). It was also unclear that the study basically consisted of two components: in 2000, a comparison of aerial photos taken in 1940 vs. 1985; and in 2003, a transect study with comparison to some transects that were also analyzed in 1983-4 and 1993-4.*

Response: The content of the Executive Summary will be reorganized.

Comment: *The background history of studies is inconsistent in providing information about the number of plots, plot size, and number of transects.*

Response: The transect discrepancies within the table will be corrected and additional discussion will be provided in the methodology section.

Comment: *Methodological information was not confined to the Methods section but, rather, occurred throughout the Appendix. The status of water quality in the study area was not clearly described (e.g., p.73).*

Response: The introduction, background, methods, and overall results sections will be reorganized. More discussion will be added on Figure 11.

Comment: *There is no mention of freshwater submersed aquatic vegetation (SAV). Has freshwater SAV been previously abundant in the Northwest Fork? What is its status at present? Does the District plan to include freshwater SAV in its future efforts?*

Response: The Loxahatchee River has been classified as a blackwater river system with little light penetrating through the water column; therefore, very little freshwater SAV is present in the river channel with the exception of some exotics (*Limnophila* and *Hydrilla*) that have come into

the system from upstream developed areas. This information will be included in the final draft of the document.

Comment: *What was the basis for the planned sampling frequencies for canopy communities and groundcover/shrubs?*

Response: The 3- and 6-year interval sampling frequencies were based on availability of staff and frequency of the physical intrusion into the sites. It was felt that the 3- to 6-year intervals would allow the sites to recover from sampling impacts created during the sampling periods. The next shrub and groundcover sampling event is scheduled for this winter 2007, after which two periods (2003 and 2007) of data will be available to quantify changes. The dbh of the canopy trees were re-measured in 2005 during the hurricane damage assessment survey and will be re-measured in 2009. An explanation of the frequency of sampling will be provided in the revised Discussion and Conclusion Sections.

Comment: *How were ranks and importance values calculated?*

Response: See response to Recommendation number 4.

Comment: *When was the DEM modeling effort initiated, and when is the projected completion date?*

Response: The existing LIDAR data cannot support the detail needed for this particular DEM. There is some money right now to acquire new LIDAR for this area. This type of LIDAR acquisition will have unique specifications because of the difficulty in acquiring this type of data in this heavily tree canopied, and wet area with dense ground vegetation. Right now the costs of obtaining this data are unknown and there is limited funding. Currently this project is on hold while additional data acquisition methods are being explored.

Comment: *Of the 10 transects and 138 plots included in the study, about half of the plots were in the Riverine reach, 37% in the Upper Tidal, and 14% in the lower tidal; moreover, only 1 transect was lower tidal.*

Response: The transect locations were chosen to primarily address the loss and stressed condition of freshwater vegetation from salt water intrusion in the tidal reach and inadequate hydroperiods in the riverine reach. The major threat to the health of the mangrove communities would be freezes, hurricanes, and eventually sea level rise.

Comment: *Is work planned to assess the impacts, as well as the occurrence, of exotic species on the floodplain communities?*

Response: In the final report, staff plans to provide more detail on the occurrence of exotic species and will attempt to assess the impacts of these species.

Comment: *In some cases, only one to a few individuals of a species was measured for dbh. Can the value of such data be clarified, since such information is not statistically viable?*

Response: All canopy species (trees greater than 5 cm dbh) within the 138 plots were measured for dbh in the 2003 study. Canopy tree heights were taken randomly.