Appendix 1-3: Authors' Responses to Peer-Review Panel and Public Comments

During September–November 2014, the peer-review panel posted their comments on draft Volume I on the 2015 SFER WebBoard at www.sfwmd.gov/webboards; public comments were also received during the review period. This appendix includes authors' responses to panel and public comments. This content was not edited by the SFER production staff and appears verbatim as posted on the WebBoard.

RESPONSES TO COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 3A

Paul Julian II[1], Grover G. Payne[2] and Shi Kui Xue

Level of Panel Review: Accountability
Reviewers: **Vladimir Novotny** (AA)

Comment #1: The first and overwhelming impression anyone reviewing this chapter will have is the fact that the BPMs, STAs and other restoration measures undertaken over the last fifteen years are working and in many instances, highlighted in this review, the water quality goals are being met. This WY report presents also positive trends and progress in water quality improvement and the District and other Florida agencies should receive praise for their work. However, great challenges still remain and work must continue and intensify. It can also be pointed out that due to ongoing long term climatic changes the challenges will be increasing and may even include land losses as the oceans will rise and disruptions by more frequent extreme weather conditions such as hurricanes.

Response #1: I speak for everyone involved in Everglades restoration when I say "Thank you for the praise." The agencies involved with restoration efforts have learned a lot throughout the years and continue to learn as restoration progresses. Even though great improvements in Everglades water quality has been achieved, it is recognized that there still is a lot to be done and there is no backing down. Implementation of Restoration Strategies as part of the Everglades Forever Act (EFA) is proceeding full steam ahead with several milestones being achieved during the last water year (please see Chapter 4, Chapter 5A, B and C) and several more to come. Other restoration efforts including but not limited to Comprehensive Everglades Restoration Plan (CERP), Central Everglades Planning Project (CEPP), Northern Everglades and Estuaries Protection Program (NEEPP; former Lake Okeechobee Protection Act [LOPA]) and others are also moving forward.

Comment #2: On page 3a-11 the writers define the criteria for assessing the impaired water quality based on the frequency of exceedances whereby exceedances between 0 to 5% of samples would be classified as minimal concern, 5 to 10 % exceedances would be classified as potential concern, and 10% exceedances would be classified as concern. They stated that such classification is based on Section 303(d) which is a section of the Clean Water Act dealing with impaired waters and TMDL. However, under this section the allowed exceedances are far more stringent. The more

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lenient above exceedances have been used by states and EPA for the CWA Section 305 assessment for reporting water quality to Congress by the states. For example, exceedance of 5 % of Dissolved Oxygen (DO) samples would not be acceptable by the Section 303(d) water quality regulations and even frequency of DO exceedance on the level of 1% would imply, according to the federal Water Quality Criteria, a violation.

Response #2: The excursion analysis protocol was developed between the Florida Department of Environmental Protection (FDEP or the Department) and the South Florida Water Management District (SFWMD or the District) for use in the annual SFER (Weaver and Payne, 2005). This excursion analysis protocol was developed to balance consistency with previous versions of the report, other State of Florida ambient water quality evaluation methodologies such as Impaired Waters 303(d) designations, and the United States Environmental Protection Agency (USEPA) exceedance frequency recommendations. This excursion analysis provides a concise summary for decision makers and the public. Furthermore, this methodology ensures results will be compatible with information from other sources provided to water managers.

The Impaired Waters Rule which is the basis for the excursion classification scheme used in this Chapter was reviewed and subsequently approved by the USEPA as a suitable method to determine water quality standard excursions including the impairment listings made pursuant to subsection 303(d) of the Clean Water Act. Additionally, the excursion analysis does not just utilize a straight 10% exceedance rate; it in fact uses a 10% exceedance at a 90% confidence level using a binomial test. This methodology is fully described in the Impaired Waters Rule (Chapter 62-303, Florida Administrative Code [F.A.C.]) and clearly indicates that the methodology is used by the State to list waters as being impaired pursuant to subsection 303(d) of the Clean Water Act. This approach accommodates large natural variability inherent to a diverse ecosystem like the EPA and is also consistent with the Florida Statute authorizing the water quality standards. Fla Stat §403.021(11).

Comment #3: DO in the Everglades was in the last years reports evaluated according to a site specific standard that calculated the allowable DO based on the time of the year and temperature, evidently mimicking the "natural" DO concentrations in the system. This standard was discussed extensively in the previous WY reviews and the discussion will not be repeated herein; however, the arguments against the protective effectiveness of this harmonic standard allowing DO concentrations to drop to very low levels remain.

Response #3: The authors agree that low levels can be a concern, but also note that relatively undisturbed areas often show low DO levels without evidence of impairment. Furthermore, it is not the purpose of this Chapter to assess or debate the effectiveness of the applicable water quality criteria. Two different dissolved oxygen criteria are applicable to the data assessed in this Chapter. Interior stations within the EPA marsh were assessed according to the dissolved oxygen site-specific alternative criteria (DO SSAC). The DO SSAC takes into account time of day and temperature of the water in an effort to determine the concentrations of DO within the water column that are protective of flora and fauna. DO levels fluctuate widely throughout the diel cycle due to several factors including photosynthesis and respiration of macrophytes and microbes, and

the large viable carbon pool which microbes utilize; and due to the high abundance of living biomass per area in wetlands, the oxygen demand is extremely high.

Because the DO SSAC is not applicable to inflow, outflow and canal monitoring locations, data from these sites were assessed using the newly revised DO water quality standard (Chapter 62-302.533, F.A.C.) which utilizes percent saturation as opposed to a concentration of DO. The new DO standard includes a time-of-day adjustment similar to the DO SSAC utilized for EPA marsh monitoring locations.

Comment #4: Pesticides were evaluated under the assumption that the Class III criteria values represent instantaneous maximum concentrations for which any exceedance constitutes a non-attainment of designated use. Pesticides were categorized based on whether the parameter was detected at concentrations above the MDL (potential concern) or at concentrations exceeding Class III criteria or chronic toxicity values (concerns). MDL was not defined in the text of the chapter and most likely it means Minimum Detectable Limit.

Response #4: The acronym MDL is defined as the "Method Detection Limit" and is defined in the chapter (page 3A-10 of the draft chapter 3A). It is worth noting that for the past three SFER chapters (i.e., three water years) pesticides and pesticide breakdown by-products were either below the MDL, Class III criteria, or not detected.

Comment #5: The criterion for assessment of phosphorus is discussed on page 3a-12 without actually stating what the criterion is. This standard (10 µg TP/L) is revealed later in the chapter in the section dealing with phosphorus.

Response #5: The criterion for assessing phosphorus is introduced on page 3a-12, as a way to organize the chapter; the authors have found it more effective to discuss the criterion in-depth where the values are presented. Otherwise readers will be flipping back and forth between sections. Furthermore, it should be noted that the often referenced and rarely applied correctly phosphorus criterion of 10 µg/L is a long-term (5-years) assessment value across the impacted and unimpacted designated networks.

Comment #6: Unit system. The authors have used predominantly SI system which is the most preferable unit system for reports aimed at an extensive national and international audience. When US system is used the chapter provides conversion factors. There is one odd unit invented by authors, the Kacre-ft, first introduced on page 3A-15 which is an awkward mix of metric prefix with an archaic US unit. Should we also have units like Kinch for 25.4 meters or mlb for 0.45 grams? Certainly not. If the authors insist on using acre-ft (why?) then 14.6×10^{3} *acre-ft (*18×10^{6} m^{3}*) would be more appropriate. For larger volumes, 99% of world hydrologists would use* Km^{3} *or 14.6 "kacre-ft" = 0.018* Km^{3}*.*

Response #6: Just as in the past, the authors will note the reviewer's comments on units and will attempt to improve our presentation. The authors would like to direct the reviewer to the preface

of the South Florida Environmental Report (SFER) where units of measure conversion factors from metric units to U.S. equivalent units are provided. Where possible the authors will include any conversions needed. For an example of the SFER preface, please see the 2014 SFER preface at the following link http://my.sfwmd.gov/portal/page/portal/pg_grp_sfwmd_sfer/portlet_prevreport/2014_sfer/front_matter/front_matter.pdf

K is a prefix in Kac-ft to indicate kilo-acre-feet and the reviewer is correct that it is used in the metric system and in lower case in the International System of Units. Technical professionals understand K as reflecting thousands regardless of units, but Kac-ft will be changed to 1000-ac-ft in the revision to avoid any confusion and to be consistent with units used in the hydrology Chapter 2.

Comment #7: Hurricane Andrea. Table 3A-1 on page 3A-15 reports water quality data collected at G-300 and G-301 diversion structures. Although the path of the hurricane missed southern Florida, a large rainfall impacted hydrology and water quality inside EPA. Of note also were low DO concentration 2 to 3 mg/L that could have adversely affect fish population.

Response #7: Noted, as in previous SFER chapters, an evaluation of any diversion events to the EPA is included in the assessment provided in the Chapter. As noted in Chapter 2 and 3A, Andrea was a tropical storm for south Florida, not a hurricane.

Comment #8: Excursion Analysis. Problems with exceedances of Florida Class III criteria were identified and summarized in Table 3A-2. Four water quality parameters were identified: Dissolved Oxygen, Alkalinity, pH, alkalinity, and specific conductance. These parameters were evaluated for inflow, interior, and outflow for each water body of the EPA. It should be pointed out that under the present scenario the DO standard is different for the inflow and outflow (Florida Class III) and interior (site specific alternate criterion – SSAC). This leads to a questionable situation where interior water quality meets the site specific more lenient standard but the same water quality would fail the inflow and outflow standard which is more stringent. The responsible agencies should again revisit the standard and, by a Use Attainability Analysis, develop a unifying site specific standard that would protect indigenous biota. During WY2014 seven interior stations violated the SSAC criterion. The DO fluctuations and exceedances in the EPA are related to the nutrient concentration promoting algal growth that by respiration depresses oxygen during cloudy days and darkness. Many wetlands are naturally dystrophic which is exhibited by a low DO.

Response #8: The reviewer raises common concerns and DO achievement is not easily done in a diverse ecosystem like the EPA.. The reviewer should be aware that, as stated in Response #3, it is not the purpose of this Chapter to assess or debate the

protectiveness of the applicable water quality criteria, rather our purpose is to assess the waters within the EPA by applying the applicable criteria to each site. However, the authors respectively disagree with the statement by the reviewer that "*This leads to a questionable situation where interior water quality meets the site specific more lenient standard but the same water quality would fail the inflow and outflow standard which is more stringent.*" Both the Class III DO criteria based on saturation and the DO SSAC based on marsh DO dynamics were developed to be equally protective of the designated use (i.e., Class III: fish consumption, recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife) of the water bodies to which they apply. For additional information related to surface water classifications and designated uses please see Chapter 62-302.400, F.A.C.

Comment #9: The water quality excursions related to pH and alkalinity may not be a concern. The apparent violations are (1) cross-correlated (low alkalinity is often accompanied by low pH); (2) related to geology of the Everglades, (3) natural acidity related to formation of humic acids in wetlands; (4) the chemistry of the interior areas is dominated by rainfall that has naturally very low alkalinity and low pH that would violate the surface water criteria. Typically, natural unpolluted rainfall has pH around 5.7 and has very low alkalinity. This again may call for an UAA type analysis. Alkalinity problem was detected only in the inflow into Refuge area.

Response #9: The reviewers comments are well considered. Historically the Refuge interior experiences very low alkalinity and low pH due to its rainfall-dominated hydrology, mentioned in previous SFERs and studied in peer reviewed literature (McCormick, Harvey, and Crawford, 2011). Even though the alkalinity and pH water quality standards are frequently exceeded under these predictable circumstances, a Use Attainability Analysis (UAA) is not needed for the Refuge. There is no evidence that the designated use has been affected or needs to be changed. The reviewer can visit the USEPA's webpage discussing UAAs, Designated Uses, and Water Quality Standards to get official interpretations: (http://water.epa.gov/scitech/swguidance/standards/uses/uaa/info.cfm).

A more appropriate method of handling the natural exceedances of the alkalinity and pH criteria is through the development of a Site Specific Alternative Criteria (SSAC) for these parameters which would recognize the unique characteristics in the Refuge without changing its designated use. However, this large technical and regulatory effort probably cannot be justified considering the information available on background conditions in rainfall-dominated areas of the EPA.

Comment #10: Specific conductance was evaluated by the Florida Class III specific

conductance which was quoted in the chapter as: Class III criterion allows for a 50% increase above background conditions in specific conductance or 1227 µS/cm, whichever is ***greater****. The reviewer believes that it criterion should end with ….****smaller*** *not …greater. For example if the natural specific conductance is 400 µS/cm, typical for EPA then the limit should be 600 µS/cm and not 1227 µS/cm. The latter would damage fish and other organisms due to salinity shock. This could result in more criteria excursions than that reported in the chapter.*

Response #10: The authors would like to point out the water quality standard for specific conductance in Class III freshwater is correctly stated and applied as "Shall not be increased more than 50% above background or to **1275** µmhos/cm, whichever is **greater**" (not **smaller**) as detailed in Chapter 62-302.530, F.A.C. Once again, the reviewer should understand that it is not the purpose of this Chapter to assess or debate the protectiveness of the applicable water quality criteria; it is to assess the waters within the EPA by applying the applicable criteria. The specific conductance criterion for Class III waters was developed to protect flora and fauna against the effects of excessive ions which contribute to the overall conductivity of the water body. Furthermore, this standard was developed to ensure that freshwater water bodies (specific conductance < 4,000 µS/cm) do not become more saline. Increases in salinity (i.e. specific conductivity) for freshwater systems would have a far greater ecological impact than slight changes of 100-200 µS/cm as indicated by studies elsewhere (Blasius and Merritt, 2002; Horrigan, Choy, Marshall, and Recknagel, 2005).

Comment #11:Pesticides and metals. The report has not reported problems of concern with the concentrations of pesticides and metals. Metals were not measured during WY 2014. On line 596 identify or correct …including III, …

Response #11: Noted, "…including III…" should be "…including chromium III…". Text will be revised accordingly.

Comment #12: Phosphorus. The second half of the chapter deals with the phosphorus and nitrogen content of waters inside of EPA. For these waters, the Florida Department of Environmental Protection established a relatively stringent numeric criterion of 10 µg/L for Total phosphorus (TP) applied to a long term geometric average of the concentrations. For nitrogen only narrative criterion is available; however, studies have proven that the EPA system is phosphorus limited. In addition to TP, the District study also measured orthophosphate and soluble reactive phosphorus (SRP). The study presents also spatial and temporal trends which are satisfactorily shown in tables, charts and maps.

In the WY 2014, for the first time in history, the geometric mean in all interior areas

(Refuge, WCA2, WCA3, and ENP) were below the long term standard of 10 μg/L. Specifically, the interior concentrations inside EPA was only 3.6 μg/L. This is very good news. The spatial gradient, as one would expect, is from the highest in the Refuge area in the north to the lowest concentration in the south in the ENP. Refuge areas receive agricultural phosphorus rich runoff. The most dramatic decreases in TP concentrations occurred in the water conservation areas WC2 and WC3. The STA study in this WY2014 report (Chapter 5b) documents that once the TP concentrations become very low, e.g., near the criterion limit of 10, further decline does not occur, as a matter of fact in this particular study at very low concentrations (1 to 10 μg/L) the removals were negative.

Since the removals of TP in very low concentrations by known mechanisms attenuating P in Everglades marshes cannot be identified or proven and the information on P in wet atmospheric deposition over ENP and WCAs were not provided, there is no information available to speculate that dilution by rainfall would drop TP concentrations below 10 μg/L. Based on the information provided in Chapter 10, WY2014 was one of the wettest years which could cause the very low TP concentrations throughout the EPA system; however, Figure 3A-13 show that flows through the EPA have not significantly changed during the last five years.

Referring to lines 800-802, define the four part test of meeting the P standard for Everglades.

The flow and mass balance flow charts in Figures 3A-11 and 12 on pages 3A 34-35 are very illustrative; however, the atmospheric contribution appears not to be included. It could be as much as 30% of the load. Please, do something with the kacre-ft unit on these figures, in Table 3A-7 and also in the text of the chaopter. For example, on line 806, (1,096 kacre ft) would be 1.3 km^3.

The decreases are even more significant for orthophosphate (page 3A-39) wherein the interior concentrations are around 1 μg/L. What is the minimum detection limit?

Response #12: The authors are not certain how to interpret the reviewer's comment "*District study also measured orthophosphate and soluble reactive phosphorus…"* The authors are unsure of what study is being referenced. Furthermore, the chapter delineates and discusses the water quality parameters measured and statistically analyzed; nowhere is soluble reactive phosphorus mentioned.

The authors are also confused by the reviewer's comment "*…the information on P in wet atmospheric deposition over ENP and WCAs were not provided…"* as the chapter clearly states in the "Total Phosphorus Loads" section of the chapter:

> "*In addition to inflow, atmospheric deposition contributes to the TP loading into the EPA. The long-term average range of TP atmospheric deposition to the WCAs*

is estimated between 107 and 143 mt per year. Atmospheric TP deposition rates are highly variable but not routinely monitored due to their high expense. The range [expressed spatially as 20 to 35 milligrams per square meter per year ($mg/m^2/yr$)] is based on data obtained from long-term monitoring evaluated by the District (Redfield, 2002)*."*

Based on the FDEP target method detection limit (MDL)/practical quantitation limit (PQL) list, the MDL for orthophosphate is 0.01 mg/L (Chapter 62-4.246(4), F.A.C.). However, the SFWMD laboratory reports an MDL of 0.002 mg/L for orthophosphate at all EPA monitoring locations identified in the chapter during WY2014.

Comment #13: Nitrogen. Apparently, the EPA is phosphorus limited in most parts; therefore, nitrogen concentrations may not be as important as phosphorus but historically N concentrations have appeared to be on a higher side. Some marine water bodies in the everglades system such as estuaries draining Lake Okeechobee (see Chapter 10) were found to be N limited. Line 991 states that "When nitrogen is limited biota (algae and plants) can offset this limitation by fixation of atmospheric N_2." This statement should be checked. Very few algae if any can fix N_2, only cyanobacteria microorganisms (e.g., Anabaena) can fix N_2 but cyanobacteria are not algae. Legume plants can fix N_2 but can they be found in large quantities in the EPA? Cyanobacteria were found years ago and maybe even today in Lake Okeechobee and many other Florida lakes and marshes.

Line 996 in parentheses should read ..(TKN= ammonia + organic nitrogen)… Recent investigations revealed that both P and N must be controlled if cyanobacteria infestation reaches very high hyper-eutrophic levels (see, Paerl et al, 2010) which is not the case of the EPA and Lake Okeechobee today.

The data on N statistics in Table 3A-7 show significant improvement since the Baseline period. Further improvement can be expected by improving the performance of agricultural BMP, STAs, by improving mileage of automobiles and in the near future even by switching to hybrid and electric cars. Automobile traffic is a significant source of NO_x emissions. However, Figure 3A-17 shows that most of nitrogen present in the EPA system is organic N. Unlike nitrates or ammonia , organic nitrogen is not readily available for algal growth,

Response #13: These thoughtful comments are duly noted. The referenced text on line 991 will be modified. However, this statement is still true since the Everglades ecosystem is known for its periphyton communities which contain a large proportion of cyanobacteria. Furthermore, as the reviewer pointed out, most of the nitrogen present in the EPA is organic N. Unlike nitrates or ammonia, organic nitrogen is not readily available for algal growth and are accumulated in the marsh as part of the natural peat accumulation processes.

Text on line 996 will also be modified to reflect "…(TKN = organic nitrogen + ammonia)…"

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Horrigan, N., Choy, S., Marshall, J., and Recknagel, F. 2005. Response of stream macroinvertebrates to changes in salinity and the development of a salinity index. *Marine and Freshwater Research*, *56*(6), 825–833.

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RESPONSES TO COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 3B

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Level of Panel Review: Technical
Reviewers: Otto Stein (AA) and Vladimir Novotny (A)

FRAMEWORK AND CONTEXT FOR AGENCY RESPONSES TO BROAD QUESTIONS AND COMMENTS:

As agency scientists attempt to understand and fully respond to peer review comments on Chapter 3B contained herein, the authors need to provide the reviewers and the public alike with an understanding of the mercury (Hg) – sulfur (as sulfate) challenge and our deliberate, long-term effort to address relevant science on the Hg problem. The Florida Department of Environmental Protection (FDEP or Department) and South Florida Water Management District (SFWMD or District) are public agencies responsible for water quality and environmental management in South Florida, as such conduct and review research in support of our missions. Scientific priorities are set by empirical relationships with defensible linkage to environmental problems, such as marsh enrichment by phosphorus or the accumulation of Hg in Everglades flora and fauna. The large differences in the interpretation of available evidence reflected in the Panel's review comments on Chapter 3B can be traced to acceptance of a unimodal sulfate-methyl-Hg (MeHg) (i.e., 'Goldilocks') paradigm as reflected in the 2013 SFER (Axelrad et al., 2013), and a frustration over agency review of available field evidence indicating undefined empirical patterns, reflected in the 2014 (Julian et al., 2014a) and 2015 (Julian et al., 2014b) versions. The general explanation for this poor predictive pattern is biogeochemical complexity, agreed by the agencies and reviewers to be inherent to marsh ecosystems like the Everglades.

Agency scientists recognize the appeal of several lines of '*prima facie*' evidence summarized in the 2013 SFER and can understand the reviewers' reaction to agency reevaluation of evidence and close examination of the predictive aspects of the Hg – sulfate

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interaction. The large unexplainable scatter in data from the Everglades Protection Area (EPA) on fish tissue Hg analyzed by multiple scientists forced our agencies to look harder at these data and other water quality parameters in the 2014 SFER and allow these large data sets to test the predictive utility of the concepts outlined in the 2013 chapter. For the 2015 report, this detailed evaluation process was taken further; various interpretations were detailed and new data were presented, particularly in the final section of the chapter on Priority Questions. The authors have looked for any solid field evidence that can be used to justify research and possible avenues to ameliorate the Hg problem. Our agencies have repeatedly taken action when definitive scientific evidence demonstrates quantitative basis for rule making. The reviewers can see this process in action through Payne et al., (2001a, 2001b, 2000) on the TP Rule, Weaver, (2004) on the dissolved oxygen site specific alternative criterion, SFWMD, (2012) on the stormwater treatment area water quality based effluent limit and FDEP, (2013) on the Total Maximum Daily Load for mercury.

In essence, the District and FDEP instead of setting aside the possible influence of sulfate on Hg, have invested substantial time and money to investigate all available field evidence on the biogeochemistry of the issue and to conduct *de novo* research outlined in the **"FACTORS INFLUENCING MERCURY METHYLATION IN THE EVERGLADES"** section of the 2014 chapter and several sections in the 2015 chapter. These efforts over the past several years have been done without rejecting or accepting the 'Goldilocks' paradigm. The reviewers' broad criticism of these efforts largely without showing specific scientific deficiencies makes this response to comments very difficult to develop and implement through chapter revisions. The following is our best effort.

RESPONSE TO BROAD COMMENTS:

In their review of this 2015 chapter, the peer reviewers provided a significant number of comments regarding the previous two SFER Chapter 3B reports. It should be noted that during this period primary authors of the chapter changed with the new authors bringing more emphasis on analysis of field data in an effort to better inform both environmental managers and policy makers alike. The external contributors in this year's SFER were either scientists under contract with the State of Florida (i.e., FDEP, SFWMD or both) or scientists conducting research of interest as identified by agency priorities (i.e., Sulfur Management Action Plan, etc.). Just as in last year's call for contributions, several past contributors to the SFER were contacted and most elected to not submit a contribution for this year's SFER.

While the broad comments from the reviewers span several years of SFERs, the authors can respond only through revisions to the draft 2015 chapter. The peer reviewer's comparisons between the current SFER and that of the 2013 and 2014 SFER highlight the dramatic difference concerning conclusions related to the role of sulfate. The authors must stress that while recognizing the key role of sulfate in promoting Hg methylation, new experimental evidence and data analyses demonstrate a very weak empirical relationship between sulfate and MeHg in sediment and fish. At the same time, other publications were calling for investment in research and regulation of sulfur, underpinned by an acceptance that somehow the poor linkage in the Everglades would still support more attention to

sulfur. This push and pull of evidence led to the reevaluation of the sulfate-MeHg paradigm in the 2014 SFER and this is continued into the current 2015 SFER. The viewpoints presented in the 2013 SFER have been reassessed in recent years as a result of several peer reviewed and technical documents highlighted in the 2015 SFER. Due to these efforts, it is the opinion of the authors that Everglades Hg science has advanced by attempting to apply anticipated patterns from past research to real world Everglades data.

The authors appreciate the technical challenge provided by the reviewers for this year's draft Chapter 3B, but also encourage another look at this year's Chapter 3B and the supporting peer-reviewed literature. Several sections of the current SFER chapter appear to have been underutilized by the reviewers. For instance, the reviewers' comment that *"The formation of methyl mercury (MeHg) is related to the biological activity of sulfur reducing bacteria (SRB)…"*, this comment is not completely correct as discussed in both "**RECENT ADVANCES IN MICROBIOLOGY OF MERCURY METHYLATORS IN THE EVERGLADES**" and the "**PRIORITY QUESTIONS FROM WATER YEAR 2014**" sections. These pages provide detailed information regarding Hg methylating bacteria and undoubtedly while SRB are present widely in the Everglades and most methylate Hg, not all SRB methylate Hg and there are other guilds of microbes that can methylate Hg as well. Some of the unexplainable variation in the biota accumulated Hg or MeHg concentrations could be generated by the type of methylators present (i.e., SRB, FeRB, methanogens, etc.) and weaken any direct influence of sulfate.

The reviews state *"…the new authors were skeptical about the bell-shaped Goldilocks' relationship…They wrote off the 2013 cutting edge result and claimed that there is no bell shaped relationship between sulfate concentration and mercury methylation."* These statements are inconsistent with the current 2015 chapter being reviewed and that from 2014. The distribution and possible interactions of sulfate is an integrative theme for most of both chapters. The "Goldilocks" concept and other aspects of S-Hg linkage are analyzed in detail on pages 3A-42 to 3A-53 in 2014 and on pages 3B-31 to 3B-40 & 3B-59 to 3B-65 in 2015. It is true that the primary author is skeptical of the "bell-shaped relationship" as an applied scientist is not easily convinced by the graphical **qualitative** relationship (Figure 3B-26) of the unimodal sulfate-MeHg accumulation relationship. No definitive quantitative (i.e., statistical) analysis of the proposed unimodal relationship has been conducted to indicate if it is an empirically valid relationship, let alone a **statistically significant one**. The authors would qualify the reviewers' use of the term "*...cutting edge…*" The literature may be cutting edge in bits and pieces and the authors do not argue against individual past studies, but the bell-shaped relationship is not consistently observed in nature.

The authors assume that the "*2013 cutting edge*" research discussed by the peer reviewers is the "**MODELING SULFATE AND *GAMBUSIA* MERCURY RELATIONSHIPS IN THE EVERGLADES"** section in the 2013 SFER (Axelrad et al., 2013). The 2013 SFER section and the companion report (Pollman, 2012) analyzed the USEPA Regional Environmental Assessment Program (R-EMAP) mosquitofish data, not soil/sediment MeHg accumulation which is the basis of the proposed unimodal relationship. They statistically modelled the **90th percentile** of the Hg concentrations in fish as a rough bell-

shaped response curve. While the curves are inviting at first glance, 90% of the data plotted (**Figure 1**) followed no pattern whatsoever with respect to sulfate and Hg. Pollman, (2012) intended to describe only the maximum concentrations by the 90th percentile approach not the sulfate and THg relationship as a whole (Julian Gu and Redfield, 2014). **When a 90% majority of the data do not support a bell-shaped curve (Figure 1B) sulfate-MeHg theory/hypothesis, then this theory is not affirmed in the Everglades, certainly not for applied scientific purposes.** This simply implies other more important factors control MeHg in water and fish, most likely related to bioavailability of inorganic mercury, other guilds of methylating microbes, organic matter, trophic structure, hydropatterns and nutrients (Julian et al., 2014a; Julian et al., 2014c; Julian and Gu, *In Press*). The reviewers are correct in their perspectives on the 1 mg/L sulfate target. Importantly, if it is assumed that Figure 1 is operative, then atmospheric deposition alone can support problematic mercury levels. In essence, the current authors' re-evaluation of data and new results from on-going research performed on the Everglades wetlands do not fully support the optimism of the 2013 report.

The broad assertions from the peer reviewers regarding this year's SFER chapter make it very difficult to revise the chapter responsively to address the overall comments. The reviewers are encouraged to re-read the 2015 chapter armed with more information and a broadened perspective. With that said, the authors will attempt to address the central theme(s) of the peer reviewers' comments via this response and final revisions, and will further clarify any topic in the chapter as detailed below.

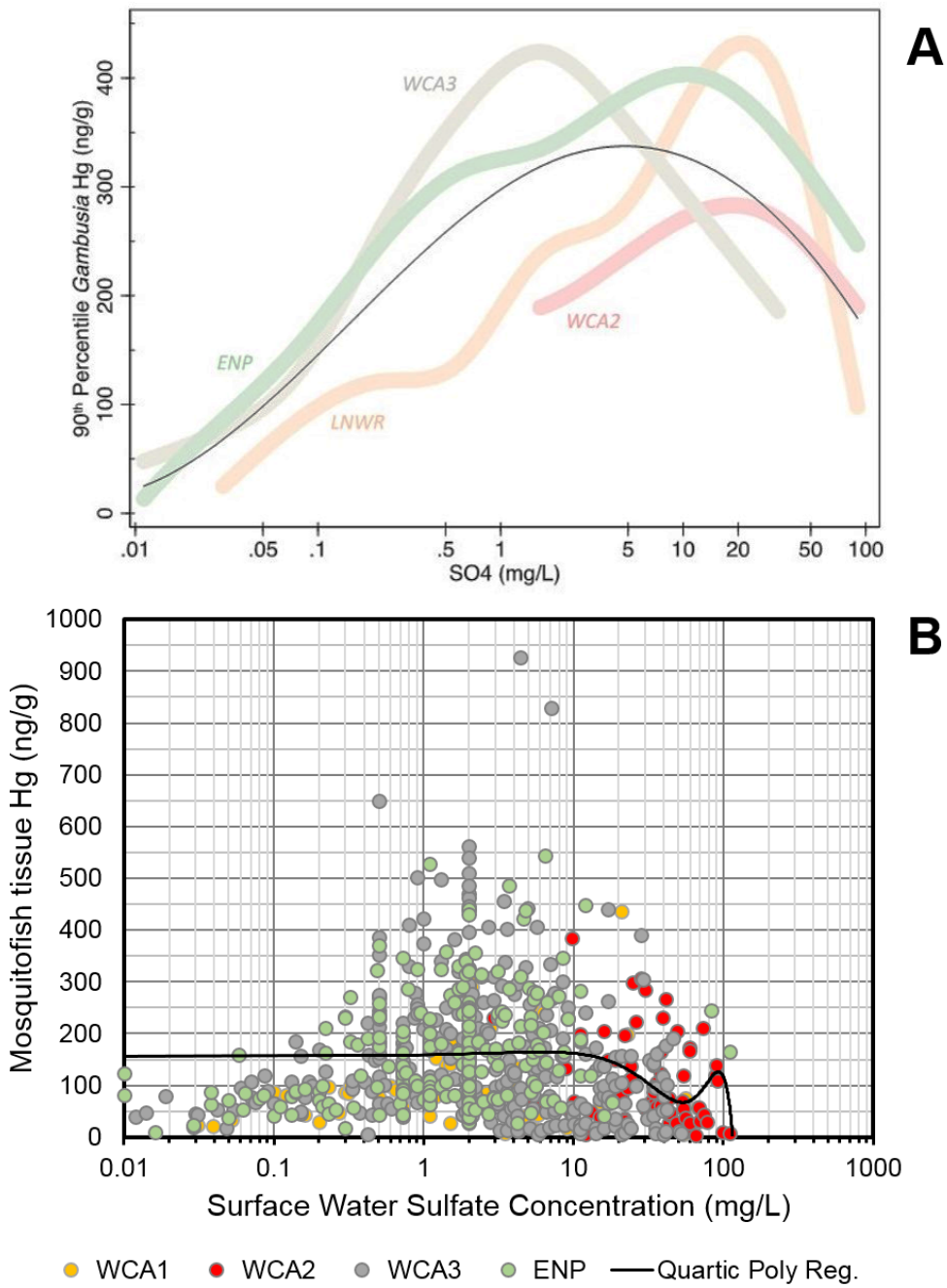

Figure 1. A) Adapted from Axelrad et al., (2013), curves represent the cubic spline (data smoothing technique) using the 90th percentile *Gambusia* spp. (mosquitofish) mercury (Hg) and natural logarithm (ln) transformed sulfate (SO_4^{2-}) concentrations. Black line represents the aggregated data for all regions of the Everglades Protection Area. **B)** Mosquitofish (*Gambusia* spp.) Hg and Ln transformed sulfate concentration for each area of the Everglades Protection Area from the USEPA Regional Environmental Monitoring and Assessment Program (R-EMAP) monitoring efforts. Black line indicates a quartic polynomial regression of all data (R^2 0.04, df 668, F Ratio 6.86, $\rho<0.01$) [ng/g = nanograms per gram].

RESPONSE TO SPECIFIC COMMENTS:

Comment #1: 286-287: This sentence led this reviewer to look at the data more closely. Figure 3B-2 shows the temporal variation of Hg within a site, but it is not clear whether the data points in the box plots are of each individual fish or the averages for each year (the caption is not clear). The text in the paragraph in question offers no further guidance. This comes into play when applying statistics to the data. If as suspected the annual means are presented and indeed vary by that much, the key might be to compare the variances within a year the variance of the means from year to year. Looking at the data in Figure 3B-3 (in which a direct comparison for a specific site is impossible) it looks as if the within-year variation is similar to the between year. Therefore the simple answer to a lack of clarity might be you are not sampling enough fish at each site and year to reduce the variance relative to the mean to determine the differences you are looking for (or you are using the wrong sampling protocol, size, age class of fish etc). This comment applies to data on fish species Hg concentration data.

Response #1: The "Methods" section (line 180) describes the method for mosquitofish collection. Each sample or value consisted of a composite sample of at least 100 homogenized mosquitofish. Since a single composite sample was collected at each site each year, year-to-year comparison within a site using statistics is impossible. In Figure 3B-3, each bar is the mean and standard deviation for each region of the EPA. During most years only one sampling site for WCA-1 and ENP were collected. Revisions will be made to the Figure 3B-4 caption for clarification, to indicate that each dot represents a value from a mosquitofish composite sample.

Comment #2: 458-468: Reviewers of this chapter have questioned previous SFER claims that Hg concentrations in the fish species monitored are continuing to decline and recognize that this year's report backs off this claim. However the point of this paragraph is salient, mercury concentrations in all monitored fish species, representing three trophic levels, have with few exceptions been high throughout the POR and continue to remain above criteria level.

Response #2: The authors agree with the panel reviewers' assessment that THg concentrations in bass remain high. In fact, lines 439-440 state "however, the median THg since WY2001 has remained in excess of the USEPA nationally recommended criterion during all years and reached its maximum value of 0.68 mg/kg (n=224) during WY2011."

Comment #3: 683-751: The summary provided in these lines is in agreement with the nicely designed mesocosm study described immediately afterward. It does appear that elevated sulfate concentrations in surface water is not a driver of P release from native soils. The line of reasoning is pretty convincing; mesocosm data support this and, more importantly, four identified driving mechanisms for sulfate P release are not relevant to the conditions in most of the Everglades. However some caution must be exercised to not over extend these results; other locations (specifically the STAs) are accumulating sediment relatively high in P content and organic matter, therefore three of the four mechanisms (all but FeS_x production) may be more active in these locations.

Even more caution is warranted when trying to draw conclusions from the MeHg results of the mesocosm study. First, the results are not backed by any identified driving mechanisms and, in fact, run counter to some identified mechanisms as well as results from the microbiology study, which showed a correlation between sulfate concentration and methylation. Additionally, mesocosm results might influenced by relatively low concentrations of elemental Hg available for methylation (data not shown, this is speculation only). More importantly any conclusions drawn from this study include only two samples taken only 1/3 as often as other water quality data. This complex issue will require considerably more research effort.

Response #3: STAs have been evaluated to determine whether their biogeochemical factors (e.g., sulfate, P, organic matter) may have been different enough from those in the WCAs to evince sulfate-induced P release from soils (Dierberg et al., 2011, 2012). Based on laboratory incubations of amended sulfate to a P-enriched inflow region STA soil (Dierberg et al., 2011) and a field investigation (Dierberg et al., 2012), no direct (**Figure 2**) or indirect evidence that sulfate concentrations regulated soil P mobilization in a STA was found.

Full-scale operational data also suggest sulfate is not adversely impacting the ability of STAs to achieve low outflow P concentrations. Among the six STAs, the STA that typically receives the highest inflow sulfate levels (STA-2) produces some of the lowest outflow TP concentrations. Further, one of the flow paths within this STA (Cell 1) has produced outflows in the range of 10 µg/L for almost a decade. As an example, STA-2 Cell 1 outflow TP concentration averaged 8 µg/L from August 28, 2013 to August 27, 2014 (DBHYDRO, accessed 10/09/14) even though the cell received high sulfate concentrations (73 mg/L at upstream control structure S-6) over the same time duration.

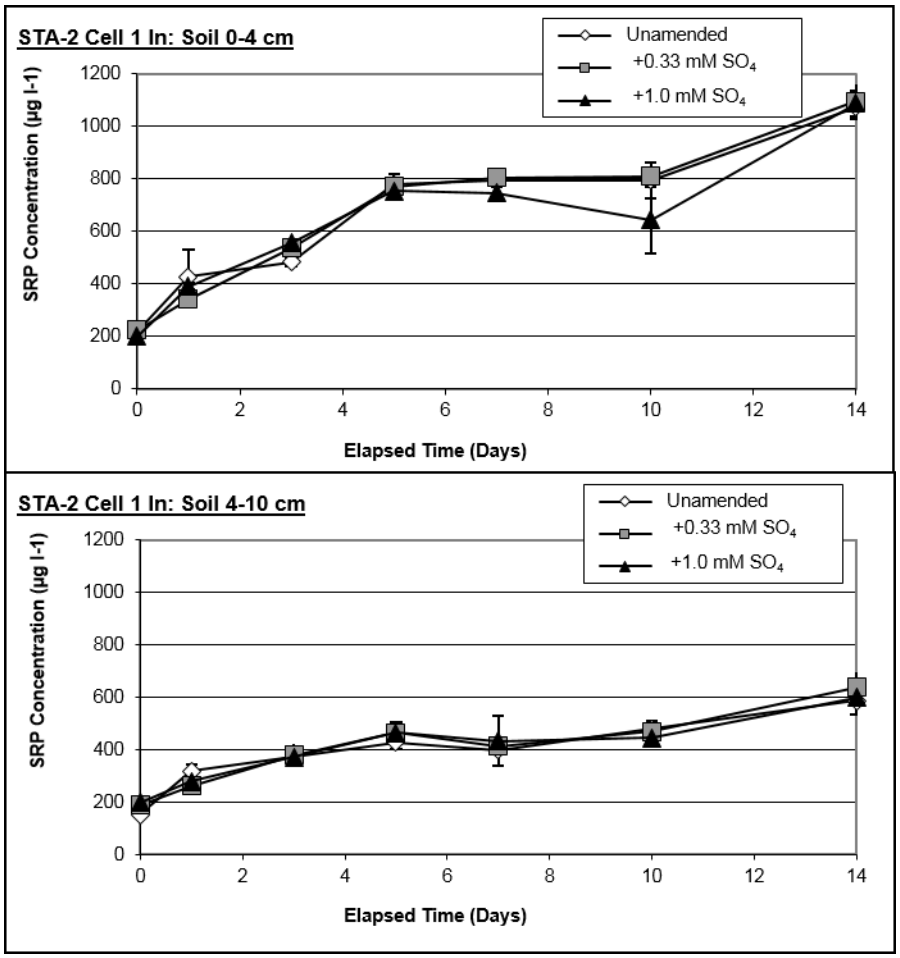

Figure 2. Release (mean ± 1 S.E.) of soluble reactive phosphorus (SRP) during a 14-day anaerobic incubation of 0-4 cm (top) and 4-10 cm (bottom) soil depths retrieved from the inflow region of Cell 1 in STA-2 on June 2, 2009. The soils were exposed to unamended and SO4-amended [with 0.33 mM (32 mg/L) or 1.0 mM (96 mg/L)] low P and low SO4 surface water from WCA-3A. Each data point represents the mean of three replicates. From (Dierberg et al., 2011).

The authors agree with the reviewers about the need to interpret the findings of the in situ mesocosm with prudence. The data were interpreted as conservatively (i.e., in line with existing paradigms of Hg biogeochemistry) as reasonable, and any extrapolation to other areas of the greater Everglades were intentionally omitted. Nonetheless, the experimental design was strong, as recognized by the reviewers, and the data are legitimate and deserve consideration.

The schedule of sampling the mesocosms is detailed in a document to be included as an appendix to this SFER, but is summarized here for the reviewers. Surface waters were sampled for "routine" analytes (P species, N species, sulfate, etc.) every other week, during monitoring seasons. Of course, monitoring Hg at that frequency is cost-prohibitive, so THg and MeHg were analyzed in samples of surface water and soils on four occasions: beginning of Monitoring Season 2 (following a regional drydown period), twice at the end

of Monitoring Season 2 (February 2012, before and after a spike of inorganic Hg) and at the end of Monitoring Season 3 (project closeout). These dates (except following the drydown) were selected such that the sulfur chemistry gradient resulting from the sulfate dosing regime would be well established at the time of Hg analysis. Note that previous Everglades in situ mesocosm experiments included n ≈ 4 Hg sample events (Gilmour et al., 2007; Gilmour et al., 2004). For clarification in the SFER, text will be added.

The authors agree with the reviewers' suggestion that availability of inorganic Hg was likely limited in the mesocosms, despite their being open to the atmosphere and likely receiving the same mass of aerially deposited Hg during the multi-year study as the surrounding WCA-3A marsh. However, the addition of Hg^{2+} did not result in increased MeHg concentrations in the soil or water (described in Appendix 3B-1). Given that most of the methylation occurs in the soils and periphyton (Cleckner et al., 1999; Gilmour et al., 1998), atmospheric (or experimental spike) inorganic Hg would need to be transported to the loci of methylation within those matrices. If that is a slow process, then low concentrations of bioavailable Hg could indeed limit methylation.

The authors recognize the difference in apparent effect of sulfate on MeHg concentrations between this mesocosm study and the laboratory incubation by (Bae et al., 2014), and acknowledge the important role that SRB have in methylating Hg during anaerobic respiration of sulfate. The difference can be attributed to the mixing of amended Hg^{2+} with the soil in the lab incubations, so this constituent was delivered directly to the methylating flora. On the other hand, the one-time amendment of Hg^{2+} to the mesocosms was made without resuspending the soil, which implies there may have been a temporal or physicochemical barrier impeding the penetration of this substrate into the anoxic zones of the soil. Note that the semi-continuous addition of sulfate over time, prior to our Hg sampling efforts, had already created both sulfate and sulfide enriched porewater conditions in the higher concentration sulfate amendment treatments. In addition to transport limitation, it is important to note that the mesocosms were much more representative of "actual" marsh conditions than the lab incubation vessels, and contained emergent aquatic vegetation (EAV), submerged aquatic vegetation (SAV), and periphyton communities, all of which have been documented to be important in the methylation, demethylation, and movement (in the case of EAV) of Hg species.

With respect to the (yet unclear) mechanisms driving the MeHg response in the mesocosms, the authors find a helpful analogy in research on sulfate-phosphorus interactions in the Everglades. Not long ago, scientists stated with near certainty that sulfate enrichment resulted in the mobilization of soil P in the Everglades (Axelrad et al., 2008; Orem et al., 2011). This reasonable hypothesis was based on a preponderance of studies conducted in wetlands without shared characteristics to those of the Everglades. However, the authors have demonstrated, both in the field and in the lab, that processes identified in other wetlands (i.e., sulfate enrichment leads to P mobilization) are not automatically relevant to the Everglades. Could the extraordinarily unique biogeochemical factors such as substrate and nutrient limitations, biota, and processes (e.g., syntrophy) in the Everglades also create outcomes with respect to Hg methylation that are different from what has been reported from other environments? The authors, therefore, remain cautious

in applying long-standing theories and processes attributable to Hg methylation developed in other environments to the Everglades marshes, without a clear understanding of the implications of the unique biogeochemical conditions present in the Everglades. The reviewers put it best when they stated that "this complex issue will require considerably more research effort."

Comment #4: 985-987: Another (more likely?) alternative is that inhibiting methanogens gave SRB a competitive advantage stimulating activity of SRB and therefore hgcA.

Response #4: Based on our interpretation of the reviewers' comments the authors respectfully have a different perspective. The alternative explanation provided by the reviewers is unlikely to have happened; SRB are generally more efficient at competing for electron donors than are methanogens, such that inhibiting methanogens wouldn't likely give a competitive advantage to the SRB.

The authors offer two independent lines of reasoning as to why the bromoethanesulfonate (BES)-amended treatment did not result in providing a competitive advantage to the SRB for enhanced MeHg production, as the reviewers postulate:

1. The first is an empirical reason derived from the experimental data set. Note that the sulfate reduction during the course of the 14-day experiment was exactly the same for the CT-II and BES treatment (Figure 3B-20), where each received 4.5 mg/L of sulfate at the beginning of the incubation. If BES addition resulted in giving the SRB a competitive advantage, then one would have expected that the sulfate concentrations for that treatment would have been lower at days 7 and 14 than the levels for the control (CT-II), but it was not.

2. From a theoretical perspective, syntrophy yields very low energy for the syntrophs; if they are capable of sulfate reduction and sulfate is available, that is the preferred route. Elimination of methanogens may disrupt syntrophy, but that in itself would not shift the pathway toward sulfate reduction.

Comment #5: 1023: The word potentially is redundant with other words and clauses in this sentence. And makes for a very weak statement.

Response #5: The authors understand the reviewers' viewpoint, but feel it necessary to include the word "*potentially"* in this sentence because sulfate can potentially influence Hg/MeHg dynamics depending on site water quality and microbial communities present. Furthermore, the statistical relationship between sulfate and MeHg is relatively weak so it seems fitting.

Comment #6: 1126-1130: It does not seem likely that changes in just flow volume would have an influence on sulfate concentration, sulfate loads surely, but not concentration.

Response #6: Thank you for your comment. For most parts of the system, flow and water column constituents are correlated, albeit in differing patterns across various parts of the

region and at different times of year. Periods of high flow occur during the wet season when heavy rainfall occurs and dilution of higher concentrations is likely. However, also during these rain events, especially during the late dry season, and the early wet, water column concentrations of chemical constituents increased due to suspension and runoff into the canals.

Comment #7: 1183: The data an Table 3B-6 (and text on lines 1134) indicate that only WCA-2 has non-significant temporal trends so this statement is not true.

Response #7: The text will be revised to include *"…No significant trend was observed for ENP inflow sulfate loads …*"

Comment #8: 1270-1273: While these data do not prove that influent sulfate is biogeochemically active in EPA and ENP they certainly imply high activity for SRB and other sulfur transformations for which there is an overwhelming set of data concluding enhances Hg methylation.

Response #8: The authors agree that sulfur cycling is active in the Everglades. However, the authors do not see that any revisions are needed. As discussed in the chapter, not all SRB bacteria methylate Hg even though there is a large volume of evidence in the peer-reviewed and technical literature that sulfur can enhance Hg methylation under sulfate-limiting conditions. There is an equally large volume of literature that demonstrates that sulfur has little effect on Hg methylation under other circumstances. For instance Windham-Myers et al. (Windham-Myers et al., 2014) and other studies (Alpers et al., 2014; Marvin-DiPasquale et al., 2014; Marvin-DiPasquale et al., 2009a; Marvin-DiPasquale et al., 2009b) observed that areal application of sulfate-bearing fertilizers had no observed impact on sulfate reduction rates or on MeHg production presumably due to the fact that sulfate concentrations were not limiting to the resident community of SRB in the region.

Comment #9: 1302-1304 and Table 3B-8: It is a little alarming to note the wide disparity for estimates of sulfur efflux from the EAA in published literature. However it is interesting to note that the James and McCormick study underestimates flow rate compared to two other measurements by a factor of approximately 4.5. It is conceivable that they missed measuring many of the potential efflux points.

Response #9: Noted, no revisions will be made on the text based on this comment.

Comment #10: 1459: For which of the three applications? Which amendment was best? A few details are lacking here.

Response #10: There was no agronomic benefit of any amendment application beyond the 500 kg/ha rate for leafy greens. All three amendments performed similarly in terms of producing the same crop yield response. The text will be revised accordingly.

Comment #11: 1498 (and earlier) It is not clear how burning sugar removes sulfur from the soil/water pools. Presumably most returns to the soil via ash or smoke deposition unless there is some proof that it is released in a vapor form.

Response #11: Fire causes combustion of residual plant matter and the soil surface which volatilizes and/or aerosolizes nutrients including sulfur, nitrogen and phosphorus (Delmas and Servant, 1988; Hogue and Inglett, 2012). Therefore, fire can remove sulfur from local soils, although the fate of the sulfur once volatilized or aerosolized is not known. It is presumed to be deposited rather quickly. Text will be revised to clarify this point.

Comment #12: 1530-1543: It would seem to this reviewer that the "shape" of the relationship between fish THg levels and water sulfate concentration is not what we should get hung up on. The Goldilocks' concept implies that Hg methylation is maximized within the range 1-10 mg/L. Presumably it would be less as the outer ranges are approached (creating a bell shaped curve) but I do not believe the relationship is quantified well enough to predict that for methylation let alone how that MeHg might influence fish tissue concentrations, with so many more factors in between methylation and fish tissue concentrations. Considering the many factors involved, the fact that fish tissue concentrations appear to higher in the appropriate range (as is certainly the case in looking at the data in Figure 3B-26) is perhaps the more remarkable conclusion. That some of the data was excluded in the analysis (I assume that the presented data is ***between*** *the 25 and 75 percentiles, but that is not what is stated) does raise some concerns but I assume the original publication provides some justification for that. As an aside, were the tails of fish tissue or sulfate data truncated?*

Response #12: Reviewers make several notable points. Note that the "Goldilocks concept" implies that Hg methylation in **sediment** is maximized within the **surface water sulfate** concentrations range 1-10 mg/L. The reviewers need to be aware that Figure 3B-26 plots the median concentration of the fish tissue Hg versus the surface water sulfate concentration with the 25th and 75th percentiles indicated by the error bars (please see the figure description). This screening method effectively removes 50% of the variability apparent in the collected data and was not discussed by the authors of the original manuscript (Gabriel et al., 2014). Furthermore, the authors suggest that the readers and reviewers also read the resulting commentary (Julian et al., 2014) for more details, but the key points are made in priority question #1, pages 3B-59 and 3B-60. These two manuscripts highlight the variability and complexities of the relationship between Hg and sulfate.

To the point of truncated data in the figure, the figure was extracted directly from the original publication. Therefore, the authors cannot be certain whether there was truncation of the actual data or an accurate representation. Possibly, log transformation tended to make high-side values appear truncated. Our experience suggests that the data spans expected levels and were not truncated

Comment #13: 1622-1627: WCA-2 is the region with the highest sulfate concentrations, so perhaps that is a confounding covariate in the alkalinity relation.

Response #13: The comment is noted, no revisions to the text appear needed based on this comment.

Comment #14: 1713-1720, especially 1716-1718: These statements are simply not supported by the data presented in this report or in other sources. Clearly the point of this section is to suggest that microbial consortia other than SRB could be responsible for methylation and that is justifiable, but to state that methanogens are the dominant consortia even if limited to just periphyton communities is not justified. In fact it is contradicted the study highlighted earlier in this report which showed that methylation was not inhibited when methanogens were but was inhibited when SRB were inhibited.

Response #14: Reviewers' comment is noted, and the text will be revised. It seems that several sentences were edited it should read to the effect of "…*These findings suggest that MPB rather than SRB were likely the dominate methylators in the periphyton communities. This possibility could explain some of the variability in Hg/MeHg dynamics within the Everglades ecosystem due to the prevalence of periphyton communities…"*

Comment#15: 1741-1742: The phrase "While these results were hypothesized…" seems incongruent with the rest of the paragraph. Results are from this study not other studies.

Response #15: This sentence just highlights the results relative to the hypothesis of the study presented which was based on previous studies. This study demonstrates that net MeHg production was likely dependent on Hg availability.

Figure and table comments:

Comment#16: Figure 3B-9: Why is natural logarithm used to transform the data? Unless there is a theoretical reason to do otherwise standard practice would be to use log_{10} values to perform statistical analysis. Also the figure has odd "ghost" data points that are hard to see.

Response #16: While different disciplines may have preferences, the authors do not think that log_{10} transformations are a standard practice; natural logarithms are used in technical and peer-reviewed statistical analysis quite frequently. Furthermore Sokal and Rohlf, (1995) and Zar, (2010) both state that logarithms in base 10 are generally utilized, but any logarithmic base may be employed. It is the authors' opinion that the usage of natural logarithm is a personal preference. With highly variable data across a very wide range, base 10 would collapse variation to a greater extent.

Comment #17: Table 3B-2: The row labeled Freshwater ENP is not mentioned so it is not clear what these data represent. The text (lines 536-541) seems to indicate that data were collected from the Tamiami colony was sampled in 2011-2013 but these data are not shown.

Response #17: Noted; the table will be revised accordingly for clarification.

Comment #18: Table 3B-4: How was atmospheric load to the Refuge calculated (which station)? Another way of interpreting this data is that depositional Hg is not easily transported by surface flow.

Response #18: The atmospheric load to the refuge was calculated using the "FL34" station location next to the Refuge within Stormwater Treatment Area 1W.

Comment #19: Figure 3B-21: Font in legend too small to read at even 150% magnification

Response #19: Noted; the figure will be revised accordingly.

Comment #20: Editorial page and line comments:

> *239: There is an extra period in the parenthesis*
>
> *630: Define PWM the first time it is used.*
>
> *693-694: This run on sentence confused the point of this study.*
>
> *1016-1243: Numerous minor edits required in this section including lines 1094, 1131, 1132, 1136, 1148, 1191, 1216*
>
> *1451-1458, esp. 1454 & 1455 Please reword for clarity; the contrast makes no sense.*
>
> *1471-1507: Several editorial changes needed here including lines 1478, 1488, 1489, 1497*

Response #20: Noted; the text will be revised accordingly.

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RESPONSES TO COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 4

Randall McCafferty, Jonathan Madden and Pamela Wade

Level of Panel Review: Accountability
Reviewers: (AA) W. Dodds

Comment #1: This chapter seems a reasonable assessment of accounting for nutrients in the sub basins of the area of interest. Most all of the chapter is reporting with little analysis of why specific BMP's are effective. It is good news that P loads are generally decreasing, but many have not shown recent improvements, and lots of variability exists among years. Could those data be used to make even more improvements at not much costs?

Response #1: Research on Best Management Practice (BMP) effectiveness has shown wide variability from site to site. For example, reduced P fertilization BMPs (soil testing placement and timing) show an estimated P reduction range of 20 to 70 percent. It is also difficult to isolate the effectiveness of an individual BMP since they are usually implemented in combination with other BMP(s) (Soil and Water Engineering Technologies, 2008). However, we know the collective implementation of BMPs throughout the EAA and C-139 basins is achieving positive measurable results. This is further supported by the EAA farm data trends representing full BMP implementation at the permit level (Appendix 4-2, pgs. App. 4-2-12 through App. 4-2-21). Research must continue to focus on comprehensive BMP plans that maximize BMP efficiencies and include a monitoring program to measure the results.

For the Southern Everglades, research on BMP effectiveness is mandated by the Everglades Forever Act (EFA), Chapter 40E-63, Part III, Florida Administrative Code (F.A.C.) and Chapter 40E-61, F.A.C. Research has been ongoing through the Everglades Agricultural Area-Everglades Protection District (EAAEPD) Master Research permit issued under these F.A.C. chapters. Findings from the research may be used to refine BMPs. Information on current research activities can be found in the EAA Basin Source Control Activities section of Chapter 4. There is not a similar regulatory mechanism for BMP research in the Northern Everglades and estuaries watersheds.

Comment #2: The lack of N control in many of the basins is concerning. The natural everglades periphyton mats appear to have substantial nitrogen fixation capacity, at least in some places, indicating that N loading could shift algal communities.

Response #2: Current and historic nitrogen (N) concentrations and loads in the Everglades are discussed in Chapter 3A and Everglades research and evaluation information is presented in Chapter 6.

The EFA mandates specific source control activities and performance levels for controlling P in stormwater runoff from the EAA and C-139 basins. For other basins that discharge to the EPA the EFA requires the Florida Department of Environmental Protection (FDEP) to issue long-term compliance permits to the District to require implementation of water quality improvement plans to ensure P levels in discharges are consistent with water quality standards for the EPA. The

Northern Everglades and Estuaries Protection Plan (NEEPP) expands the boundary of the Northern Everglades to include the St. Lucie River and Caloosahatchee River Watersheds and to apply the requirements of Rule 40E-61 for phosphorus source controls to these additional areas. The NEEPP also requires nitrogen source controls and nutrient reduction programs within the St. Lucie River and Caloosahatchee River Watersheds. These areas are tributary to estuary and coastal communities where nitrogen has been found to play a larger role in the health of the ecosystem.

Comment #3: In general time series analyses are necessary to predict 1) if any particular year represents much of an improvement, and 2) the actual long term trends against variable processes. For example in the data from table 4.4, there is no apparent improvement after the year 2000. Furthermore the data in 4.4 suggest that the models over predict TP loads by about 50%.

Response #3: In the EAA, the reductions reported are based on a methodology that compares actual P load data collected for a single current year (with BMPs in place) to a base period (prior to BMPs being implemented). Implementation of BMPs began in WY1992 and was fully in place by WY1996. The P Load compliance calculation methodology is incorporated into Chapter 40E-63, Appendix 40E-63-3, F.A.C. and includes an algorithm to adjust for rainfall variability to ensure an apples to apples comparison between periods. The model calculates what the P load would have been had the current water year's rainfall amount and monthly distribution occurred during the base period (WY1980 through WY1988) before BMPs were implemented. This is the predicted load and the difference between the predicted and observed load is the reduction attributed to BMP implementation, not an over-prediction of loads. The annual percent load reductions plotted in figure 4-3 show a favorable trend. Although the reductions appear to be leveling off since WY2000 they are consistently greater than the required 25% reduction. There is no requirement in the rule for reductions beyond 25%.

Comment #4: Figure 4.8 shows why 5 year rolling window might not be the best visualization tool. Here and otherwise a regression with only the baseline or only the post baseline data included may give the best idea of trends, particularly if confidence bands are also plotted.

Request for clarification from reviewer: Figure 4-8 is not compatible with your comment. Please verify the figure number you are referencing.

Reviewer's response to request for clarification: Comment #4 I mean Figure 4.3. The idea would be use all the pre data as a way to generate a confidence band (from 1980 to 1988), and then use a linear or non-linear function from that point forward (it looks like maybe a 2nd order polynomial to fit the remaining data including a confidence band around that regression line. Just running a 5 year mean gives no indication that it is known something changed at the beginning, and no indication of how much certainty there is about improvement over prior conditions and how certain it is the 25% has been exceeded.

Response #4: A regression with the base period or "pre" annual load data was used to generate a prediction function by multivariate regression with rainfall amounts and monthly distribution. The decision to adjust for the rainfall amounts and distribution is documented in Chapter 40E-63, Appendix B2, pg. B2-4, F.A.C.: "Hydrology, that is discharge and rainfall, is a dominant factor when computing phosphorus loads. Because rainfall and discharge are subject to large temporal and spatial variation in south Florida, the evaluation for performance adjusts the phosphorus load to account for hydrologic variability. In addition to annual rainfall, significant influence of intra-annual rainfall on phosphorus loads has been observed and use of a relationship based on the

monthly variability of rainfall is physically justified, in addition to having the greater statistical power."

Within a regulatory context, the 25 percent load reduction target and the 90 percent confidence limit for the EAA were adopted by rules within Chapter 40E-63, F.A.C. for compliance purposes; i.e. to be out of compliance, the target would have to be exceeded 3 years in a row with a theoretical confidence limit of 87.5 percent or the limit exceeded in a single year with a 90 percent confidence limit. The compliance methodology was adopted by rule as reasonable to achieve consistently over the long-term. The relative comparison between the observed annual loads and predictions each year is reflected in the EAA percent total phosphorus load reduction presented in Figure 4-3. The 5-year rolling average was utilized as a presentation tool as it tends to smooth out the annual variability in the reductions providing the reader with a clearer picture of potential upward or downward trends.

Though the equivalent percent reduction to the limit load could be plotted on Figure 4-3, it likely would not make clear logical sense or add value for this basin which consistently exceeds its reduction requirements. Concepts of this comment will be considered for application to other basin trend plots within the chapter in the future to represent the expected and observed variation in basin runoff loads.

Comment #5: I suggest a very short section on methods including QA/QC which refers to the specific documents where the details of methodology are given in more detail.

Request for clarification from reviewer: Please indicate what section of the chapter and specifically what methodology this comment pertains to.

Reviewer's response to request for clarification: Comment #5 I really meant for the nutrient data throughout the chapter. There are many years of analyses here, potentially done in different labs. If a unified QA/QC program was used for all, than very shortly referring to a document with a short description would suffice. If multiple labs and methods were used, then maybe a synoptic table? Since time series are important here, being certain trends are real is necessary.

Response #5: The majority of water quality data presented in Chapter 4 and Appendices 4-1, 4-2 and 4-3 are collected by District staff or District contractors operating under a Field Sampling Quality Manual following the requirements of Chapter 62-160 Part II, F.A.C. In addition, the water quality analyses are conducted at the District lab operating under a Chemistry Laboratory Quality Manual certified under the Florida Department of Health (FDOH), Environmental Laboratory Certification Program (62-160 Part III F.A.C.). Before the data is made available, it goes through rigorous Quality Control procedures to identify outliers, missing data, etc.

The authors will consider adding a brief description of the QA/QC procedures in future reports. EAA permit level data presented in Appendix 4-2 is collected by the permittees holding individual permits. These permittees (or their contractor) are required under Chapter 40E-63.136 to have an "acceptable water quality monitoring plan which provides reasonable assurance that annual water discharge and total phosphorus load are accurately documented". The water quality data presented in Chapter 4 and Appendix 4-1 for the Tidal and Coastal Caloosahatchee sub-watersheds are provided by Lee County, the City of Cape Coral, and Sanibel Island. The water quality data presented in Appendix 4-3 for upstream monitoring sites was required to be collected by local drainage districts (South Broward Drainage District, Indian Trace Development District, North Springs Improvement District, and Acme Improvement District), following FDEP Standard Operating Procedures (SOPs) for Field Activities and analyzed by a Florida Department of Public Health-certified laboratory. North Springs Improvement District has also collected data for the

"into" structure NSID1 (structure data is presented in Chapter 4 and Appendix 4-3) since 2009 under similar requirements.

Comment #6: A little more analyses on concentrations as well as loads could be useful in parsing out effects driven by factors other than discharge-driven differences in loading rates.

Response #6: Noted. It is recognized that load is driven by runoff volume and concentration. Concentration itself is less influenced by hydrology than load, though controlling nutrient impacts to downstream water bodies primarily depend upon loading. Furthermore, statutory and regulatory mandates for water quality from the Everglades Construction Project basins or to Lake Okeechobee are based upon nutrient loading. Thus the majority of performance metrics are based on nutrient load rather than concentration. Chapter 4 presents both load and concentration data, however the majority of the evaluation methodologies are based on loads Additional concentration data are reported in Appendix 4-1 (Northern Everglades watersheds), Appendix 4-2 (Everglades Construction Project (ECP) basins), and Appendix 4-3 (Non-ECP basins).

Comment #7: Also, more detailed analyses of inputs and outputs, as in Chapter 8, may shed more light on mechanisms of removal and avenues for further improvements.

Response #7: The purpose of Chapter 4 is to provide an update on the District regulatory source control programs mandated by the EFA and the NEEPP. The chapter presents nutrient load levels as runoff and reductions achieved through implementation of source control programs within the Northern and Southern Everglades. The reductions are a measure of how the BMPs affect stormwater runoff from the basin made up of all permittee properties. It is not a mass balance for the EAA. The reported load levels and reductions take into account any external inputs to the basin but analysis of those inputs are not within the scope of this Chapter.

Comment #8: Line 60. Reduction mass per year?

Response #8: This represents a mass as stated: "The total *cumulative* reduction in TP Load runoff from the EAA since WY1996 is 2,853 *mt*,"

References:

Soil and Water Engineering Technologies. (July, 2008). Final Report Tasks 1, 2, and 3 For Project Entitled Nutrient Loading Rates, Reduction Factors and Implementation Costs Associated with BMPs and Technologies. SFWMD Contract PO4500028716

RESPONSES TO COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 5A

Jennifer Leeds

Level of Panel Review: Accountability
Reviewers: Otto Stein (AA)
Comment #1: Panel Comment (in italics; copy verbatim from web posting)

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

The chapter articulates the status of several construction projects designed to enhance the performance of the STAs so that they meet the WQBEL. The projects are divided into three flow paths Eastern, Central and Western. In WY 2014 work progressed in the Eastern and Central paths but apparently no work has been started in the Western path. However 2025 is the anticipated completion date for all projects.

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

The chapter makes liberal use of figures and tables creating an easy-to-follow organization structure.

Are findings linked to management goals and objectives?

The reasons for these new construction projects is documented in the Summary section at the beginning of the Chapter.

Is there any constructive criticism and guidance to offer for the District's large-scale programs?

As was suggested last year it would be logical to have Chapter 5A and 5C be reviewed by the same reviewers. This is probably more critical for review of 5C (which requires knowledge contained in 5A) than for 5A (which could stand alone without 5C). Additionally, since these chapters really focus on the "big picture" of STA performance, it makes sense to assign AA and A reviewers to it.

Editorial page and line comments, suggested text changes in *italics*:

1The interior text of Figure 5A-4 is too small to read properly.

Response #1: Author Response

Thank you for the review. For the Western Flow path, projects are anticipated to begin in 2019 and will be reported on accordingly. Figure 5A-4 is from the final plans and specifications and the text cannot be adjusted, however we will look for a replacement figure.

RESPONSES TO COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 5B

Holly Andreotta, Michael Chimney, Tom DeBusk[1] , Brian Garrett, Lawrence Gerry, Jaimee Henry[1], Delia Ivanoff, Mike Jerauld[1], Michelle Kharbanda[1], Michael Kirkland, Neil Larson, ShiLi Miao, Tracey Piccone, Kathy Pietro, Larry Schwartz, Dawn Sierer-Finn[1], Lou Toth, Shi Kui Xue, Yaoyang Yan, Manuel Zamorano and Hongying Zhao

Level of Panel Review: Technical
Reviewers: Otto Stein (AA) and Peter Dillon (A)

Comment #1: The Everglades Stormwater Treatment Areas (STAs) constructed south of Lake Okeechobee were designed and operated to remove phosphorus from runoff entering the Everglades Protection Area. Their large area of 27, 00 hectares (68,000 acres) consist mainly of marshes vegetated by submerged and emerging aquatic vegetation (SAV and EAV). About 83% of the total area provides effective treatment. Following the format adopted last year, the first part of the chapter provides an annual reporting of measured flow and P removal data and measuring the areal extend of SAV and EAV. There are 6 STAs, each divided into several cells, so most of the flow passes through several cells in a plug flow fashion. The overall assessment of performance of the STAs area is given in Table 5B-1. The flow weighted annual removal rates in percent were very good to excellent ranging from 76 to 88 percent. These P removal rates are higher than those expected for designed (constructed) wetlands treating stormwater runoff. It should be noted that the inflow P concentrations were low to average (from 71 to 198 µg/L0 when compared to those, for example, in urban runoff and the STAs were able to reduce the outflow concentrations to approximately 20 µg/L, which is the goal for the ENP. Incidentally, the hydraulic loading rates (HLR) (with exception of STA 5/6) are close to those suggested for free surface constructed wetlands (2.5 – 5 cm/day) in the Water Environment Federation wetland design manual . The STA 5/6 had much smaller HLR (0.6 cm/day) and P load rate PLR (0.5 g P/ m2-year) than the other STAs and had the highest P removal (88 %).

Response #1: So noted. However, please be aware that the goal is to achieve compliance with state water quality standards in the Everglades Protection Area (EPA), including compliance with the Everglades phosphorus criterion (10 µg/L). The reviewer's reference to a 20 µg/L goal for Everglades National Park (ENP) is incorrect; there is no such requirement.

Comment #2: The second part of the chapter contains specific studies such as the cause of SAV decline in some portions of STAs, or P removal in very low P concentrations. The last study documented that at very low P concentrations the removal rates are small to negative.

Response #2: The District has no response to this comment.

Comment #3: The chapter, although relatively well written with a good organization is greatly suffering from using a mishmash of SI and US units to the point of being absurd. We are living in the twenty first century. Both systems are used in almost all tables. Graphs and tables in the first ortion of the chapter use archaic ppb, the second portion is using SI and generally a common

[1] DB Environmental, Inc., Rockledge, FL

approximately equivalent µg/L. Acre-ft, which is an archaic unit of volume, is often used for flow. Because of the use of US units a simple set of equations on page 3b-31 which in the SI system would be dimensionally consistent has to include a set of conversion factors. Conversion to SI units are not provided. They should be provided in parentheses if the writers select to keep the archaic US units. Note: This comment is supplied by the "A" reviewer who is new to this chapter. The "AA" reviewer notes that similar comments has been leveled by virtually every reviewer upon first reading, yet the District still mixes and matches units throughout this chapter year after year. Perhaps it is finally time for District to heed the comment.

Response #3: The authors will provide a footnote in the front of the chapter with the appropriate conversion factors for measurements that are expressed in non-SI units, such as cfs, ac-ft and ppb. In addition, all appropriate conversion factors will be included on page 5B-31. However, Chapter 5B will continue to report P concentration as ppb, surface area in acres, flow in cfs and volume in ac-ft because these are District standards.

Comment #4: The individual reporting for each STA followed a prescribed format. At some STAs vegetation management to control emergence of "undesirable species" such as lettuce and water hyacinth relied on the use of herbicides which apparently was claimed to be safe. Although the water hyacinths are often in Florida a nuisance plant without control, water hyacinths are known as very effective, more than 90%, removal of nutrients and could be let to grow in some cells. They could be removed by cutting and the biomass can be used for production of biofuel. However, this may be very risky on such a large scale.

Response #4: Harvesting vegetation in the STAs has been suggested by SFER reviewers in the past. This approach to managing floating aquatic vegetation (FAV) is not currently under consideration for a number of reasons, including: 1) mechanical removal is very expensive and disruptive to the wetland ecosystem, 2) the lack of biomass disposal locations and high associated costs are an issue, 3) a viable market for plant byproducts, such as biofuel, has not materialized in south Florida, although some have tried and 4) it removes carbon from the system that may be critical to P transformational processes. The District abandoned mechanical removal of aquatic vegetation in favor of herbicides many years ago because the mechanical approach was ineffective at controlling plant growth when attempted on a large scale.

Comment #5: The chapter also commented on dry-out impact and some difficulties with keeping the wetlands hydrated. In addition to bringing flow by pumping from other parts of the Everglade system and from Lake Okeechobee, a method used in some designed wetlands is to implement recycle of the outflow which may further improve the removal efficiency. On the other hand, the SFWMD study found that periodic shorter duration dry-outs are detrimental to SAV communities but not to EAV wetlands. It could also be pointed out that especially in Europe dry-outs have been also used for preventing and control of highly undesirable cyanobacteria which have been found in many Florida lakes.

Response #5: So noted. The STAs do not have a problem with undesirable cyanobacteria.

Comment #6: A special study starting on p. 3b-53 describes in detail the attenuation of the components that comprise TP, i.e., dissolved ortho phosphate, and soluble reactive phosphate. TDP, TOP and SRP were not defined so the description in this review is just a guess. The logical conclusion of the study was that removal of TOP and SRP is slower than that of TP which contain a large portion of particulate P.

Response #6: TP is defined on pg. 5B-1. TDP and SRP are defined on pg. 5B-43. The acronym TOP is not used in the chapter.

Comment #7: The organization of the studies on areal extent of SAV in the various STAs is quite cumbersome. In general, these are not separate studies but rather one study with virtually identical methods applied to several field sites. There are some minor differences in the water quality measurements but the dependent variable is always SAV coverage. It seems it would be easier to followif goals, objectives and methods were defined once and the Results and Discussion be organized by STA.

Response #7: The authors will revise as suggested. Note that the goals and objectives for the survey varied slightly for each location.

Comment #8: Throughout the SAV studies water quality results are typically presented as outflow and occasionally inflow concentration data. Yet inflow and influent concentration varies temporally and spatially and various cells are of different sizes and shapes making any comparison of simple effluent concentration data dubious and dependent on non-scientific phrases such as "for nearly identical flow rates". Results and analysis should incorporate commonly used normalizing parameters such as influent/effluent ratios, flow weighted means, and hydraulic residence times. Likely this observation is just a symptom of a larger issue with this chapter, "facts" are presented with little to no attempt at synthesis of the results, a comment that has been raised in previous reviews.

Response #8: The authors will change the concentration values to flow-weighted means. The purpose of the SAV survey reports is to document the condition in specific cells and was not meant to be a comprehensive synthesis of the data for the purpose of determining correlations or cause and effect. Vegetation condition is one of the many factors that affect P reduction in the STAs.

Comment #9: On a practical note, the reviewers question the investment the District is making in the use of SAV in so many cells. Clearly this vegetation assemblage is difficult to manage with susceptibility to storms and dry-out, unexplainable die-off, predation, uncontrollable population shifts and generally large areas of open water where plants should be. The District appears to be sold on fact that it is the best community assemblage for P removal, and it clear that very good P removal is possible when everything is working (and growing) as designed. However, the terminated study and much of the data presented in earlier portion in this year's chapter and data from previous years indicate that equal, or nearly equal treatment is possible with EAV or possibly FAV, with far fewer management issues. Until the District can prove that it can grow and maintain stable SAV communities, it should stop or slow additioan conversion of cells to SAV.

Response #9: P removal via SAV uptake has been an important component of the long-term success of STA operations. Aside from direct P removal from the water column, SAV promotes Ca-P co-precipitation as water-column pH increases during photosynthetic activity and provides ample substrate for periphyton colonization. The District recognizes the issues associated with maintaining healthy SAV communities and continues to develop and implement management measures to address these issues. For example, in the past 6-7 years, the District has created large EAV zones (vegetation strips) in SAV cells that serve multiple purposes such as creating wind/wave breaks, increasing cell compartmentalization, and provide treatment functional redundancy. Treatment functional redundancy refers to a strategy for enhancing or providing additional P removal pathways to complement the existing P uptake mechanisms dominant in SAV communities. The District feels that providing redundant P removal pathways helps ensure maximum performance in SAV cells by providing greater resilience to disturbances such as extreme weather events. Although EAV cells have provided treatment to low P levels in some of

the STAs, it is the downstream SAV cells that afford additional treatment to further lower P levels.

Comment #10: 172-192 (and in other sections): An explicit description of how oft-mentioned parameters are calculated (as suggested last year) is much appreciated as it removes any ambiguity of what the parameters represent.

Response #10: The requested equations also were included in last year's chapter.

Comment #11: 286-288: The eastern flow-way of STA-1E was also dry as mentioned in other locations.

Response #11: The authors will edit the text to include the eastern flow-way of STA-1E.

Comment #12: 365: A better quantitative description than an "enormous" population increase of island applesnails, e.g., # of organisms/m2, should have been used instead of dramatic but inappropriate term "enormous". This is repeated in other sections of the report. The special study on STA 1-E attempted to explain the emergence of applesnails that decimated SAV in the cell which resulted in a decline in efficiency. While this study reported the facts and consequences it did not attempt to find causes and possible means of prevention.

Response #12: The authors will include density estimates based on sweep net samples and hand sampling in square meter quadrats. The authors will also describe the factors considered in attempting to identify a cause for the increase in snail density.

Comment #13: 392 (and similar sections): Note this is a repeat comment from last year. It is unfortunate that bird nesting success is at odds with P removal objectives. While not an expert in avian behavior, it would seem that these conflicts could be minimized if certain small areas within the STAs were dedicated as bird nesting sites. This could be done by construction of bermed areas or perhaps more effectively by construction of small "islands" within the cells. In fact, areas of higher topography would more closely mimic the original landscape of islands and sloughs and have little influence on the hydraulics of the individual flow-ways or cells if oriented properly. It could be an extremely cost-effective way to minimize habitat and water quality conflicts.

Response #13: The District has not changed its position on this issue since last year. Therefore, last year's response is provided again this year (see below). The District does not believe that the suggested modifications to the STAs would work as the reviewers envision and very likely would exacerbate the STA-bird interaction problem.

> "Similar suggestions to mitigate the impact of ground-nesting birds on STA operations have been made over the years, e.g., building nesting islands within the STAs, building wetlands adjacent to the STAs, building nesting areas on the perimeter levees surrounding the STAs, etc. These suggestions are all predicated on the assumption that such areas would divert birds away from the cell interiors to these new locations. We have little doubt that such areas would attract birds (e.g., black-necked stilts, killdeer, common nighthawks, and potentially several other ground-nesting birds). However, it is also very likely that providing additional nesting habitat would attract birds to the STAs in even greater numbers. Black-necked stilts use the STAs because they are very productive systems with ample forage and provide high-quality nesting sites as the cells dry out. In addition, black-necked stilts are not a colonial nesting species, so some birds probably would continue to use the STAs in preference to any new nesting areas. A single active nest within a flow-way triggers the same response from

the District as having a great many nests. We also have concerns that building alternative nesting areas would attract other protected species that currently do not use the STAs to do so and may further interfere with STA management activities. We have found that keeping cells flooded before nesting begins, provided we have sufficient water, limits potential nesting sites and is an effective way to minimize the impact nesting birds have on STA operation."

Comment #14: 412: In general, the Latin names of all species should be given the first time they are mentioned. While scientific literature protocols would demand this at all locations, the reviewers are fine with use of common names in this Report, provided they can identified with the scientific name when first mentioned.

Response #14: The scientific names for the two plants in question, water lettuce and water hyacinth, are provided on line 196, the first time they were mentioned in the document.

Comment #15: 572-575: Good performance of STA 1 and 2 is attributed to the fact that they have never been farmed which supposedly reduced the P flux from the soil. However, the performance was not different from some other STAs which were farmed.

Response #15: Antecedent land use is just one of many factors that are thought to have an impact on STA performance. One of the goals of the Science Plan is to understand further what those factors are, including a comparison of areas that were previously farmed versus areas that were never farmed.

Comment #16: 981: This section describing SAV coverage typically uses mg/L as the unit for P concentration (except Figure 5B-23), while the rest of the document typically uses micrograms/L. Units should be consistent, at least within a section.

Response #16: The authors will revise this section to make the P units consistent with the rest of the chapter.

Comment #17: 984-986: A complete double check of dates mentioned in the document is warranted. Clearly SAV establishment could not have started before the STA became operational as stated here, but in a check of which value is right this reviewer notes that Table 5B-1 stated the STA started in 2004, line 314 states 2005, as does Figure 5B-5. Some confusion is inherent when WY does not match calendar years, but a start date cannot span three years.

Response #17: The authors understand the confusion and will ensure that the text and dates mentioned are in agreement and clearer. In the case of STA-1E, the confusion lies in the fact that the cells started operating in September 2004 (which was in WY2005) for emergency operations during a hurricane and during the period of vegetation grow-in, but the actual online operation when the Central and Western flow-ways were available for routine flow through did not occur until October 2006 (WY2006):

Line 984 – STA became operational in WY2006 (online operation of Central and Western Flow-ways)
Table 5B-1 – Sept 2004 (start date; WY2005, for emergency operation and cell hydration only)
Line 314 – began operation in WY2005
Figure 5B-5 – first data available was from WY2005

Comment #18: 986-989: See the comment line 412.

Response #18: The scientific names for the plants mentioned in this section are provided on the following lines: southern naiad and muskgrass on line 212, coontail on line 221 and hydrilla on line 222, the first time they were mentioned in the document.

Comment #19: 1114-1122: Displaying results only as measured concentrations is probably missing (or masking) many important factors driving performance of the system. Even if flow conditions are similar between the four spatial gradients shown in Figure 5B-27 (flow rates not provided), clearly influent P concentrations are not, as shown in Figure 5B-28. A more telling story might be revealed if relative concentrations (C/C0) were plotted. This would normalize for concentration variability and to a certain extent, flow variability as well.

Response #19: Figure 5B-28 will be revised to represent relative concentrations (C/C0).

Comment #20: 1148: The previous two vegetation studies described how the vegetation density measurements were taken, but this one does not. Presumably by the same or very similar methods, but this is not mentioned.

Response #20: The authors will revise the text and refer to the methodologies.

Comment #21: 1180-1182: These date suggest that the non-uniform width of this wetland reactor has a negative influence on P removal. Not only should gates on the south side be shut, but perhaps the entire rectangular-shaped extension to the south should be abandoned to the flow path of this cell. It would not be surprising to discover that other non-uniformly shaped cells throughout the STAs have responses similar to this one and, now that expansion of STAs areal distribution is complete, tweaking of the plan form shape within individual flow ways and cells is appropriate.

Response #21: STA expansion is not complete; in fact, the STA-1W Expansion Project is currently in the design phase. The potential need to address the non-uniform shaped cells in STA-1W is being considered on a parallel path with the design of the Expansion Project.

Comment #22: 1199-1207: See the comment line 1148, while a little more information is provided here, it is incomplete. If vegetation sampling is indeed the same thought all these sections, perhaps a detailed description could be given once and subsequent sections reference the method, noting anything that might have been different.

Response #22: The authors will revise the text and provide details on methodologies in the first SAV section. Subsequent reference to the same methodologies will be done by referring to that first SAV section.

Comment #23: 1250-1253: Another alternative is that P removal is achieved by the dominant vegetation types in each of these cells, including the upland/ woody species. Note: Are the data in Figure 5B-43 for the entire flow-ways (including the upstream EAV cells, or for just the SAV cells? If it is for the entire flow-way no meaningful comparisons can be made between vegetation types in the downstream SAV cells since inputs to those cells are not known.

Response #23: This is a good point. The data presented were for the entire flow-way, therefore, the inflow data represent what went into the EAV cells, and the outflow data represent TP concentration at the outflow of SAV cells. The authors will revise the figure and replace the inflow data with inflow to the SAV cells.

Comment #24: 1311-1313: Abundance increased from when, 2011? This is not clear as Figure 5B-45 shows a decrease with time (within the WY 2014). When did the manual inoculations occur? Is the success visible in the data presented?

Response #24: The authors will clarify this in the revised version and also annotate figures with dates of inoculation.. Abundance increased up to the first half of the water year (September 2013 figure) and then declined again in the later part of the water year (February 2014).

Comment #25: 1311-1350: Why are the April 2014 survey data not shown in Figures 5B-46 and 47? The text indicates the SAV die off was profound and influenced effluent P concentrations yet the graphics suggest a rosy picture with nearly full coverage of SAV. In fact this entire section is very confusing with statements indicting increased SAV coverage (within a limited range) while in general coverage decreased; that die off in cell 2B is what caused its exiting P concentration to increase relative to the adjacent flow-ways when, in fact, all flow way SAV cells had a massive die off. There is no synthesis of the facts relayed in each statement, which when compared to each other, seem contradictory.

Response #25: Aside from the data presented in Figures 5B-46 and 5B-47, there were no other ground SAV surveys conducted. The text referred to aerial surveys (visual observations made from a helicopter, which provided a rough estimate of the affected area). The authors will make the revision in the methodology and discussion to clarify this report.

Comment #26: 1470: What is the P:N ratio? If it is phosphorous to nitrogen, how does its value relate to the rest of the discussion in this paragraph focused on the ratio of live to senesced leaf litter nutrient concentrations?

Response #26: It was an error. It should not be the "P:N ratio"; rather, it should read as "P and N re-translocation percentages". This change has been made in the text.

Comment #27: 1476-1477: This is a frighteningly damning statement. It clearly implies the study was terminated for the simple reason it was not providing the result the District would like to see. Virtually all the field data in this and previous reports suggests that when operating properly effluent P concentration are going to approximately 20-25 ppb regardless of retention time, vegetation type, etc. (see for example the data in Figure 5B-27). Considering than influent values in this study are near this background level, these data seem to confirm that even under controlled conditions and regardless of vegetation type, this is the lower limit of possible performance of the STASs. It is interesting to note that the following discussion has some of the best synthesis of the reported data of any study reported in this chapter with potentially important ramifications for future research and operational guidance, yet it was the study that was terminated.

Response #27: The District would like to clarify that the study was not terminated for the reasons stated by the reviewers. The study was terminated after 27 months due to factors that rendered the results uninterpretable, including: 1) P export from soil observed in the first year that resulted in P concentrations much higher than inflow TP, 2) shift of vegetation composition from the original target vegetation types (e.g. the water lily treatment became water lily and SAV, and the control with no vegetation became an SAV treatment) and 3) P export observed in the months preceding the project termination date. In addition, there were concerns about the artifacts of using mesocosms for this type of study. After a series of internal reviews, it was decided to terminate the study and re-design any future work to reduce the interferences and better address our research questions.

Comment #28: 1507: Should the word between above and below be and or to? The distinction is important to the meaning of the sentence.

Response #28: It should be to. This change has been made in the text.

Comment #29: 1531: Is the litterbag study the same as the decomposition study?

Response #29: Yes, the litterbag study is the same as the decomposition study.

Comment #30: In several figures (typically maps) interior typeset is too small to read at 100% magnification. Either the type should be made bigger relative to the figure or the figure should be made bigger on the page. A good rule of thumb is type size should be as big as the document text at the same magnification. Affected figures include: 5B-20, 5B-25, 5B-26, 5B-30, 5B-33, 5B-34, 5B-45.

Response #30: The authors will revise the figures as suggested.

Comment #31: Figure 5B-25: What are the test cells identified in the legend?

Response #31: These are experimental wetland cells and are not included in routine SAV surveys.

Comment #32: Figure 5B-36: Clearly the concentration is higher from the hydraulic dead-zone of this cell, but does the shape influence the flow rate of individual culverts? My guess is kinetic head is negligible at all culverts and flow is virtually the same through each culvert (assuming diameter and elevations are equal). However use of flow-weighted concentration values or mass load instead of raw concentration would avoid any ambiguity.

Response #32: Additional information on flow through those culverts will be provided in the revision.

Comment #33: Figure 5B-48: It might be beneficial to shade the temporal region of these data to correspond to the total SAV coverage measured throughout this period of record. Apparently (see comment from lines 1311-1350), part of the story is that the timing of SAV die off varied between flow ways and the effect can be noted the P concentration data. This is not clear from the discussion however.

Response #33: The authors will annotate the figures with the dates of SAV surveys and the observed die-off.

*Comment #34: 202: …**manufacturers**. None of these products **bioaccumulate** and…*

Response #34: Edit made to text.

*Comment #35: 877: were less **than** the rates*

Response #35: Edit made to text.

*Comment #36: 894: (Cells **6-2**, 6-3, 6-4, and 6-5)*

Response #36: Edit made to text.

*Comment #37: 1039: **defoliation**…*

Response #37: Edit made to text.

*Comment #38: 1216: prior **to** being dewatered*

Response #38: Edit made to text.

*Comment #39: 1222: southernmost region and **has a** lower*

Response #39: Edit made to text.

*Comment #40: 1290: geo-references **stations** in each cell*

Response #40: Edit made to text.

*Comment #41: 1474: seven month **initial** period*

Response #41: The statement indicates that TP removal was observed after 27 months, so adding "initial" to the sentence is incorrect. No change made to the text.

RESPONSES TO COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 5C

Larry N. Schwartz

Level of Panel Review: Accountability
Reviewers: P. Dillon (AA)

General
Comment a. Does the draft document present a defensible account of data and findings for the areas being addressed that is complete and appropriate?
This sub-chapter presents a brief overview of eight studies that are in progress and that are the core of the Science Plan for the Everglades Stormwater Treatment Areas. The Science Plan and the studies all focus on methods to reduce the output of phosphorus from the STAs. Because all of the studies are in an early phase, they understandably have no real findings to present at this time. The study schedules are realistic, the progress to date, although brief, is informative and the future activities consistent with the detailed study plans.

Response: Comment acknowledged.

Comment b: Is the synthesis of this information presented in a logical manner, consistent with earlier versions of the report?
The material is presented in a very clear and logical manner with the exception of the second project, and is consistent with the detailed Science Plan included on the SFER website. For the second project, I had a difficult time following what was actually going to be done (and why) without reading the detailed study plan on the website. I particularly liked the chart provided with the fourth project on STA 3-4 Performance, Design and Operational Factors. A comparable chart for the other 7 projects would be welcome.

Response: Schedule information is provided for each study. The fourth project, Investigation of STA-3/4 PSTA Performance, Design and Operational Factors, is the continuation of an ongoing project that is complex with many tasks so the chart was developed to present this information.

Comment: Are findings linked to management goals and objectives?
All of the studies contribute very directly to the management goals and objectives in that they all focus on ways of reducing P output from the STAs.

Response: Comment acknowledged.

Comment: Is there any constructive criticism and guidance to offer for the District's large-scale programs?
There is considerable information in the scientific literature on nutrient removal in groundwater using e.g. applications of iron-containing mixtures as a barrier to P flux. Some of these methods/substances could be useful in the first project.

Response: Iron-containing mixtures are included in the evaluation being performed in the study on the Use of Soil Amendments/Management to Control P Flux.

RESPONSES TO COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 6

Fred Sklar and Thomas Dreschel, Editors

Level of Panel Review: Technical
Reviewers: Walter Dodds (AA), Otto Stein (A)

Review of Draft 2015 SFER Chapter 6

Comments by Walter Dodds "AA" reviewer

Overall this series of reports on ongoing studies is well written and represents an impressive body of work related to conservation of and restoration of the South Florida/ Everglades complex. Most of the comments here are minor points or suggestions for future research.

Comment #1: The hydrologic patterns section makes little sense where it is relative to most of the discussion, as most of the text is dedicated to how the patterns influenced the wading bird populations, and some of the discussion on the plant communities. Statements that water levels were "good" or "bad" make little sense without reference to the following section.

Response #1: Author Response:

The hydrology section is meant to convey a general sense of the relevance of the science we have been conducting and refining over the last 25 years. It is also meant to show how disconnected one WCA is from another. There are few ecological parameters that can be used consistently across such a broad landscape and indicate if the hydrology is "good" or "bad." As mentioned on line 161, these three key indicators (peat, tree islands and wading bird foraging) are vital to the weekly discussions that the SFWMD has with the CORPS and the public on the state of the system. The concept of red, yellow and green status is a well-established convention for all the CERP Indicators and Performance Measures. We will edit lines 157-176 to convey the need for this perspective and try to do a better job of clarifying what is meant by good and bad hydrology.

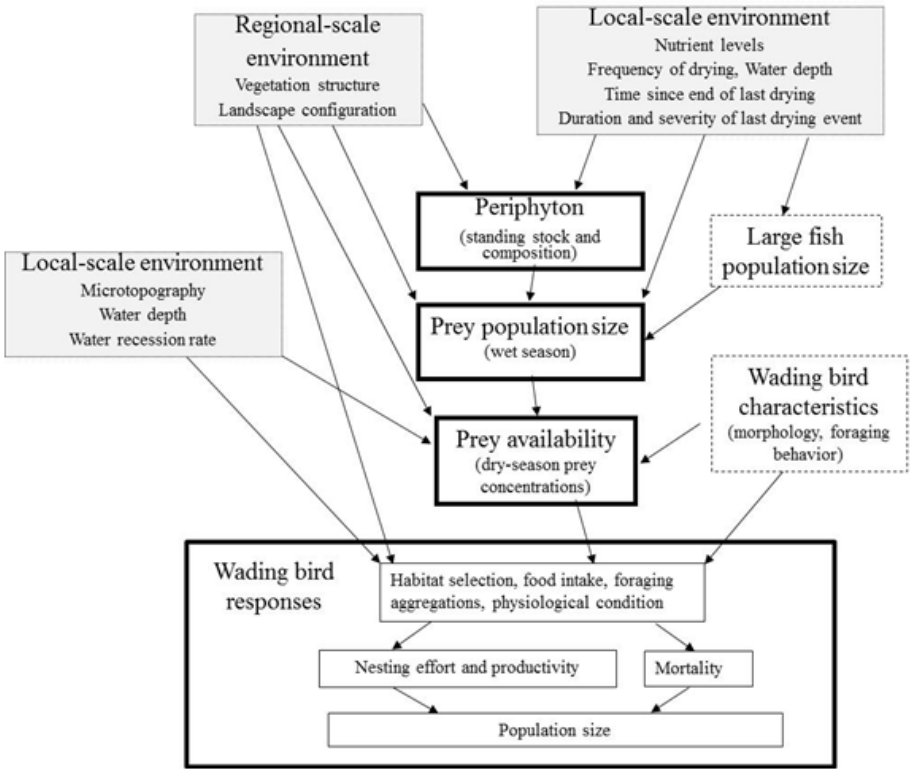
Comment #2: In the wading bird section, most of the discussion requires the reader to take statements on faith with respect to controlling factors. There appear to be enough data to create a conceptual model of shorebird recruitment (via structural equations modeling or a similar approach), and test it with some leave-some out approaches, creating plots of observed verses predicted nesting rates for each species. The chapter 8 approach to modeling P inputs and retention is an example of such modeling (though the bird modeling will be more variable because more factors may play in). Still, this

approach would allow parsing out controlling factors and make for a stronger presentation of the year's results and linkages to hydrologic patterns. It is particularly concerning that tricolor herons are doing so poorly, and good predictive models are really needed to solve this problem.

Response #2: Author Response:

The District agrees that there is insufficient background information, largely due to space constraints, but we will try to rectify this by providing relevant references to the text. In short, multiple conceptual ecological models have been developed as a framework for evaluating, synthesizing, and organizing existing understanding of key ecological linkages among hydrological drivers and wading bird responses in the Greater Everglades. The example below is the primary conceptual model the District uses to guide its wading bird and prey related research (see Fig 1. http://www.evergladesplan.org/pm/ssr_2012/ssr_2012_pdfs/2012_ssr_full_web.pdf).

Figure 1. Trophic Hypothesis for CERP MAP linking environmental drivers affected by restoration and wading bird population size. A chain of direct and indirect effects link human actions to wading birds, largely mediated through wading bird food availability during nesting season. Environmental drivers are in grey boxes, monitored variables discussed in this SSR are in boxes with bold borders. Ecological factors discussed in this report, but not monitored, are in boxes with dashed borders.



Using this conceptual model as a framework, the District and collaborators have developed a number of studies, including predictive statistical models, that have been instrumental for guiding and informing weekly operational decisions and for testing among competing restoration scenarios. For example:

Dorn, N.J. & M.I. Cook (in review) Wetland dry disturbances indirectly release crayfish from predator limitation. Ecology

Cook, M.I., E.M. Call & R.M. Kobza, S. Hill, C. Saunders (2014) Seasonal movements of crayfish in a fluctuating wetland: implications for restoring wading bird populations. Freshwater Biology 59: 1608–1621

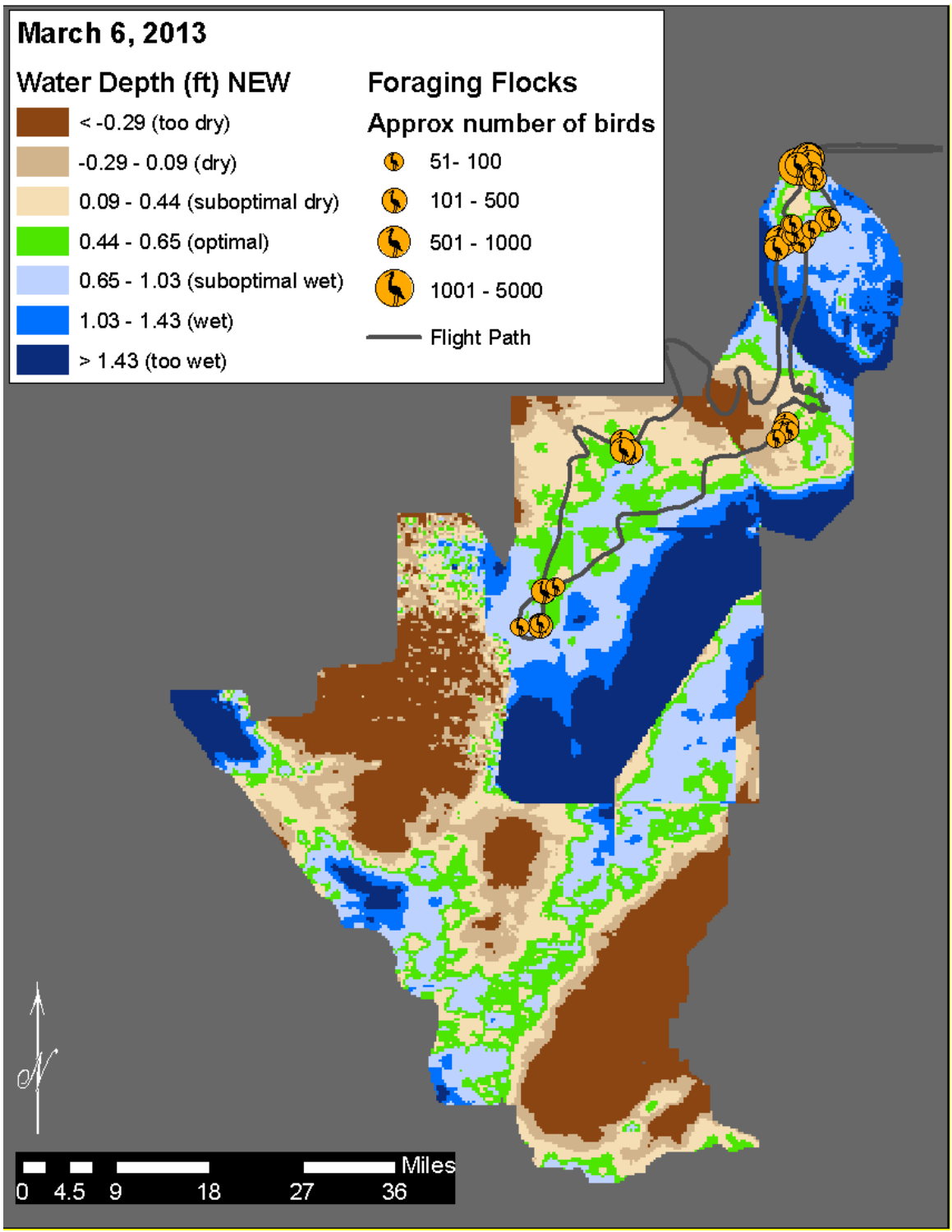
Dorn, N.J., M.I. Cook, G. Herring, R.A., Boyle, J. Nelson, & D.E. Gawlik (2011) Diet variation among white ibis (*Eudocimus albus*) chicks: prey composition depends on recent hydrologic conditions. Ibis 153:323-335.

Beerens J.M., Gawlik D. E., Herring G. & Cook M. I. (2011) Dynamic habitat selection by two wading birds species with divergent foraging strategies in a seasonally fluctuating wetland. The Auk, 128, 1–12.

Herring G., Gawlik D.E., Cook M.I. & Beerens J.M. (2010) Sensitivity of nesting Great Egrets (*Ardea alba*) and White Ibises (*Eudocimus albus*) to reduced prey availability. The Auk, 127, 660−670.

Currently, these models and studies are largely restricted to understanding and predicting foraging conditions for the larger, white species, which are relatively easy to count/study and for which we have a wealth of monitoring and experimental data. In this respect, we are getting very competent at accurately predicting where and when these birds will be foraging in the ecosystem (e.g. see Fig. 2). What we are less confident about is how these foraging conditions translate into nesting effort and success, making predictive modeling about reproduction impracticable at this point (although such modeling efforts are now in development: see Beerens 2013). Moreover, we have insufficient information on the foraging and nesting behavior of the smaller more cryptic herons, which are considerably more difficult to count and observe using current monitoring approaches than the white birds. However, the District is trying to address this issue and is currently working with USGS to develop some simple predictive models.

Fig.2. Habitat Suitability Map showing the probability of detecting foraging White Ibises and Great Egrets in relation to water depth (optimal foraging areas are shown in green) in real time across the Greater Everglades landscape. These maps are produced weekly and are based on the EDEN hydrologic model and models of wading bird forging depth preferences. They are validated with aerial surveys that determine the location and size of observed foraging flocks.



Comment #3: Line 29. Too many significant figures

Response #3: Author Response:

The District agrees that the estimate is not as precise as suggested so we have reduced the number of significant figures in the text. However, the District is not provided with error estimates associated with these counts (see last year's response to the reviewer for a detailed explanation why) so it is difficult to determine what the appropriate number of significant figures should be.

Comment #4: Line 74. What does "widely correlated" mean?

Response #4: Author Response

This term will be clarified in the text.

Comment #5: Line 335 "Slough as a result of favorable hydrologic conditions" this kind of statement can be found throughout this section. What exactly does favorable mean here, most of it seems to be value judgments based on maintain waterfowl, but explicit explanation and a more scientific approach to the presentation would be better in this entire section.

Response #5: Author Response:

In this particular case, "favorable" was referring to the above average water levels meaning that the hydrologic conditions were favorable towards creating and maintaining above average water levels. Text will be edited to clarify instances of "favorable" within this section. None of the Florida Bay hydrology text is referring to waterfowl preferences as targets in this area are more focused on benthic vegetation and prey-species of fish and invertebrates.

Comment #6: The warmouth movement section is a nice addition with the second year of data. It would be good to combine movement data with gut content data so some of the speculation about moving to shallow areas to feed can be backed up with data.

Response #6: Author Response:

Thank you, the District appreciates your support for this research. Diet information would indeed be useful and we hope to be able to collect such data in future studies.

Comment #7: The BOH might also be useful for rapid detection of the extent of harmful algal blooms. It would be nice to see some quantification of the actual spatial resolution of the images and where they begin to blur.

Response #7: Author Response:

Good suggestion. We have provided resolution numbers in this report and will attempt to provide a greater level of quantification in future SFER reports on the BOH.

Comment #8: The peat bag experiment is interesting and innovative, longer term results will be needed to prove efficacy, I would view this as a preliminary or pilot experiment.

Response #8: Author Response:

Thank you, the fact that this needs to be a relatively long-term test is why we are conducting the initial studies in LILA. We have already nearly two years of growth from the initial pilot study, with monthly photos. We understand that this is preliminary and not a highly controlled study but an initial proof-of-concept series of tests.

Comment #9: Line 858. The discussion has the first mention of herbivory, was this formally measured?

Response #9: Author Response:

Observations are being made and photos taken on a monthly basis, but no quantitative measure of herbivory is being made. It is believed that some quantification of herbivory can be gleaned from the monthly digital photos when they are analyzed.

Comment #10: Table 6.4 N P and C units, moles per what?

Response #10: Author Response:

Units for C, N, and P are moles/ g dry weight and atomic C:N and N:P are mol/mol. We will enter the correct units.

Comment #11: Line 980. Do you mean 5 species were responsible for over 70% of the dry mass of leaf fall?

Response #11: Author Response:

Yes, five species contributed with more than 70% of the total leaf fall production. We will edit this line

Comment #12: Line 1007. Do you mean relatively low soil P concentrations? There seems little pattern in N

Response #12: Author Response:

Yes, poor nutrient conditions are associated, mainly, to low soil P concentrations. Also, Nitrogen shows very spatial pattern.

Comment #13: Line 1037. Interesting observation, is leaf quality changing? Maybe anoxia stimulates growth to a bit then pushes over a threshold and causes death?

Response #13: Author Response:

Comment #14: Line 1044. Soil nutrients do not operate over large scales.

Response #14: Author Response:

We will edit this sentence.

Comment #15 Figure 6.28 and others. Any ideas on why the bimodal distribution of growth rates from head to tail of island? Pretty interesting trend.

Response #15: Author Response:

I think that the bimodal distribution of growth rates is associated to the time of the year when tree islands are relatively dry and leaves are fully developed prompting higher growth during this period. A detail physiology study will help to understand better this growth trend.

Comment #16 Line 1090, tense problem

Response #16: Author Response:

Herbicide damage to more desirable ridge and slough species were minimal, short-lived and

Change "were " to "was"

Comment #17: Line 1139. It is too bad total N and P are not reported, could these parameters be added in?

Response #17: Author Response:

As stated on this line, annual averages of all parameters measured, including TDN and TDP, are not statistically different between WY's 2012, 2013 and 2014 with the exceptions noted. The reviewer is referred to previous SFER's. A more complete update will be provided in future SFER's.

Comment #18: The Florida Bay story could use a bit more analysis, what is driving the variation in chlorophyll?

Response #18: Author Response:

There are many factors that influence the nutrient content and chlorophyll a variation including inflows, storm events, circulation patterns, nutrient recycling and even construction events. It is not possible to attribute any one of these factors as the most important, but rather it is likely a synergistic effect of some or all of them that influence the nutrient content and chlorophyll a variation. Previous SFER's have reported on this subject and the reviewer is referred to these and especially the 2007 SFER and Appendix 12-3 of that report.

Comment #19: Figure 6.33 can get rid of y axis 2 decimal points numbers… round to whole number.

Response #19: Author Response:

The figure will be redone.

Comment #20: Figure 6.34 Y axis units?

Response #20: Author Response

The figure will be redone.

Comment #21: Line 1234. Several quadrats? How many?

Response #21: Author Response:

The term "several" is used here because each of the monitoring programs uses different numbers of quadrats and subareas per site. Due to space limitations, the reader was referred to a previous version of the SFER for a more complete description. As a quick synopsis: FHAP uses 30 subbasins with a single site within each subbasin and 8 quadrats per site. DERM uses 4 or 12 subbasins (depending on location) with a single site within each subbasin and 4 quadrats per site. Audubon of Florida uses up to 6 sites per transect and 12 quadrats per site. Data for FHAP and DERM are analyzed at the basin level while Audubon data is analyzed at the transect level.

Comment #22: Line 1285, what does bleed through mean. Interpolation turns hard boundaries into smoother gradients than they really are?

Response #22: Author Response:

Yes, that is correct. Spatial interpolations are essentially weighted averages of measurements in a defined "spatial neighborhood" around a prediction point. In the

absence of barriers, this spatial neighborhood encompasses all measurement points within a defined straight line (as the crow flies) distance. In the presence of barriers, this straight line distance may inappropriately extend through barriers causing bias (bleed through) on either side of the barrier. The District has utilized a spatial interpolation tool that accounts for barriers and limits bias (bleed through).

Comment #23: I don't understand figure 6-36 b

Response #23:

Author Response: That is reasonable given that it is a complex figure. The authors hoped that the combination of the figure caption and description in the text would be sufficient.

Comment #24: The entire section on Synoptic Florida Bay Ecosystem Assessment is a little thin on data presentation and analyses.

Response #24:

Author Response: It is true that there is a lot of data behind this section that warrants further exploration. Perhaps this will be presented in a future SFER.

Comment #25: Line 1323. This is a strange methods section, could use a little more information here.

Response #25: Author Response:

Some additional text will be added to clarify the methods.

Comment #26: The SUBMERGED AQUATIC VEGETATION MODEL ANALYSIS section has nowhere near enough information to be evaluated. The figure has no axes labels and means little.

Response #26: Author Response:

The units for the plot are in the legend but it was cropped in the editing process. The figure will be redone and axes labeled. The text of the section will be reviewed for clarification.

Comment #27: Line 1413. Flow is discharge or water velocity?

Response #27: Author Response:

Change to: "**flow velocities were** minimal. The third subsection examines the results of climate change workshops"

Comment #28: Line 1538. I don't understand how SF6 can be used as a flow and dispersion tracer without correction for aeration. Does this just mean the flow paths, but no rates?

Response #28: Author Response:

Since we can measure SF_6 over 5 orders of magnitude, gas exchange makes no practical difference to our calculation of advection and dispersion. See Ho, D. T., P. Schlosser, and T. Caplow (2002), Determination of longitudinal dispersion coefficient and net advection in the tidal Hudson River with a large-scale, high resolution SF_6 tracer release experiment, *Environ. Sci. Technol.*, *36*, 3234-3241, doi:10.1021/es015814+.

Comment #29: Line 1575. I had not heard of this... it is just a plain cool method!

Response #29: Author Response:

We respectfully agree with this comment.

Comment #30: Line 1632. But it should not vary from the fluorescence for that reason…

Response #30: Author Response:

Velocity of the dye was determined from the movement of the leading edge, which would incorporate the effect of dispersion. SF_6 advection was determined from the movement of the center of mass of the tracer patch, which does not include the effect of dispersion.

Comment #31: Line 1634. And loss to the atmosphere

Response #31: Author Response:

No, this is not the reason.

Comment #32: Line 1664 and elsewhere, use real symbol for microns

Response #132: Author Response:

Line 1664 "median volume weighted size of suspended particulates (D50) was initially larger (330 um) with"

Line 1666 as reflected in values of D50 as low as 50 um (Harvey, pers. comm.).

Should be changed to

Line 1664 "median volume weighted size of suspended particulates (D50) was initially larger (330 **µm**) with"

Line 1666 "as reflected in values of D50 as low as 50 **µm** (Harvey, pers. comm.)."

Comment #33: Fig 6.42 is sort of difficult to read and figure out

Response #33: Author Response:

SEE RESPONSE #35

Comment #34: Line 1707, but not sf6, which could be related to not getting aeration effects out of the picture.

Response #34: Author Response:

Correcting SF_6 for gas exchange would not change the calculated advection and dispersion rates.

Comment #35: Figure 6.44 too small to read effectively.

Response #35: Author Response:

All figures were revised to increase font size and readability. The original figures were also numbered incorrectly in the reviewed draft. The corrected list and number of each revised figure (with brief description) is below (NOTE figure 6-43 was split into 2 separate figures, 6-43 and 6-45).

Figure 6-40 Map of study area and water tracer (SF6 and Dye) trajectories

Figure 6-41 Velocity profiles

Figure 6-42 Water quality (TP and TPP)

Figure 6-43 Critical Entrainment Threshold velocities measured with benthic annular flumes

Figure 6-44 Dual Synthetic Tracer movement at RS1

Figure 6-45 Sediment transport and water velocities measured at sites RS1, C1, and RS2

Figure 6-46. Flow vectors around the L-67C canal and levee

Figure 6-47. Sediment accumulation (left) and sediment bulk density (right) in L-67C canal backfill treatments

Figure 6-48. Catch-per-unit-effort (CPUE) of large fish community within the DPM study area

The revised figures with corrected numbers and captions are provided in files:
SFER_2015_DPM_Fig6-41to48_revised-141010.pptx
and
SFER_2015_DPM_Fig6-40_revised-141010.pptx

Due to change in figure content and numbering, figure call-outs in text should be revised as follows:

Line 1698: change “Figure 6-43” to “Figure 6-45”
Lines 1724 and 1729: change “Figure 6-43” to “Figure 6-46”
Lines 1736 and 1748: change “Figure 6-44” to “Figure 6-47”
Lines 1756 and 1759: change “Figure 6-45” to “Figure 6-48”

Other changes to figure call-outs are provided in additional comment/responses below.

Comment #36: POTENTIAL FUTURE CLIMATE SIMULATION WORKSHOPS: this section is difficult to really evaluate directly because it represents so much work with a modest amount of information, but it is good to see that the team is working on this and a special journal issue will be more generally useful than this report.

Response #36: Author Response:

We appreciate your support of this effort. We will report on future research as appropriate.

……

Comments by Otto Stein “A” reviewer

Note that Appendix II indicated that the level of review is at the “Technical” level.

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

Broad questions and comments that should be addressed:

The chapter provides an overview of the current year's efforts to assess the success of activities designed to restore the ecological health of the greater Everglade region (from the WCAs to Florida Bay). In general, the chapter provides an appropriate summary of the current year's monitoring activities. The Chapter is well-organized and Table 6-1 provides the reader with a summary of the specific studies reported on more detail throughout the chapter.

The breadth of the district's research program is apparent from the studies presented; from the scientifically dubious, but practically relevant study on floating peat bags to the technology-focused linking of remote sensing and ecological models to predict cattail expansion, to several intensive monitoring programs. Most of the studies are adequately described to give the reader a sense of what was done and what was discovered in an abbreviated format but a couple (mostly those that are more complex) need a little more information. Since the review is technical, we are to provide guidance as to whether we believe the findings and conclusions are supported by the information presented. When the answer to this is no, it is due more to lack of completeness of reporting, than a lack of proper analysis. The more data dense studies (such as the Decomp Physical model) are more likely to be in this category. Suggestions for improvement are given by line and figure number.

Specific questions and comments by line number.

Comment #37: 163-167: These two sentences seem contradictory; if the peat drought tolerance criteria is one foot below the ground surface how can the surface be "essentially the same as the threshold"?

Response #37: Author Response:

Drought tolerance is not the same as peat conservation. The Drought Tolerance is realted to the Palmer Drought Index and is indicative of fire potential. The peat conservation term is a restoration index designed to alert water managers of the potential of high soil oxidation due to high decomposition rates.

Specific Edit: Add to line 167 - We use the concept of peat conservation to indicate what is needed to restore a hydrologic environment that will prevent soil oxidation of the ridges and tree islands. The drought tolerance concept is a peat fire potential index and as such does not capture this restoration criteria.

Specific Edit: Change Line 163 to: Tree island flooding tolerances are considered exceeded when depths on the islands are greater than 12-2.5 feet for more than 120 days (Wu et al., 2002).

Comment #38: 333-354: This section seems incongruent with previous discussion and the data in Figures 6-9 and 6-10. The management importance of Taylor Slough is lost to the reader. What are the purpose and/or the target salinities that the South Dade

Conveyance System is attempting to remedy? The second paragraph claims salinity has increased above the mean and MFL criteria but this is not supported in the figures. Are the high values collected in WY 2015 (after April 2014?). If so, then the last sentence should reference WY 2016; if not, then something else is wrong.

Response #38: Author Response:

As part of the restoration initiative, there is a desire to deliver more water into Taylor Slough and to retain water within Taylor Slough. This derives from two impacts of the Central and South Florida canal system: the disconnection of southward flows to Taylor Slough caused by the canal system and the drainage of Taylor Slough caused by the C-111 canal to the east. There was an attempt to address the flow disconnect in 2000 (calendar year), where the installation of some pumps (including S-332D) to direct water into Taylor Slough was a large component. Most recently, the C-111 Western Features Project (WFP), which is intended to maintain water within Taylor Slough, was constructed and became operational in June 2012.

The above average salinity mentioned in the text referred to daily salinity while the figures show monthly salinity for consistency with previous reporting. Daily average salinity rose rapidly in April and was above average by the end of the month. This will be clarified in the text.

The exceedance of the MFL criteria occurred in WY 2015 as already detailed in the text. However, the MFL is defined on a calendar year basis because the most vulnerable time for the MFL spans the end of the dry season of one water year and the beginning of the wet season for the following water year. In the text, if "WY" was not included before the year, then the calendar year was being referenced. Therefore, an exceedance occurred in calendar year 2014, and if an exceedance occurs in calendar year 2015, it will be a violation of the Florida Bay MFL.

Comment #39: 427-428: What interval is to be returned to?

Response #39: Author Response:

Less than every 2.5 years. I have added this to the text.

Comment #40: 509-510 (and earlier): What is the difference between tactile and visual foragers?

Response #40: Author Response:

Tactile foragers are those birds that tend to forage with their bills in the water and detect and catch their prey through touch and snap reflex (storks, ibises, spoonbills), while sight foragers first see their prey and then catch it either by standing/stalking and a rapid lunch forward (e.g. great egret, great blue heron), or by more active pursuit (smaller herons and egrets). We have added some of this information to the text.

Comment #41: 517: This is a nice study providing data useful to water management decisions.

Response #41: Author Response:

Thank you, we very much appreciate the support.

Comment #42: 643: "Unmanned aerial systems" is certainly an obscure term for what I believe you are talking about. Why not "unmanned aircraft" so the reader does not have to guess what you are talking about.

Response #42: Author Response:

Unmanned aerial systems are how unmanned aircraft are referred to in the industry now. The explanation is that an unmanned aircraft is only the actual aircraft. The system refers to the aircraft, the payload inside, and the ground station that accompanies it. This is industry standard. I have no issues with changing it, but I don't think it completely captures the concept. I'll leave it up the to the editor's discretion.

Comment #43: 710: What is the "head" of a tree island? The upstream point, high point, or something else?

Response #43: Author Response:

It is the highest part of the tree island, typically located within the upstream third of the island. Will add text to clarify

Comment #44: 734: Is Dineen Island a ghost island or a remaining healthy one?

Response #44: Author Response:

Dineen Island is a ghost island, will clarify in the text.

Comment #45: 801-805: Need a more clear description of the experimental design.

Response #45: Author Response:

Will add text to clarify.

Comment #46: 821-823: This statement begs an obvious question in my mind; Why not get rid of the pot altogether and plant just the root plug into the peat bag?

Response #46: Author Response:

We utilized the pot for additional support to the growing sapling and to provide an additional 15 to 20 cm in elevation.

Comment #47: 826-849: This should be reworded to make the experimental design more clear.

Response #47: Author Response:

Will be reworded to clarify.

Comment #48: 891: While the potential utility of this study is clear, analysis of the reported data is typically a comparison of litterfall and growth rates <u>within</u> a healthy tree island or a degraded tree island. However the stated objectives are to <u>compare</u> pristine and degraded islands. More analysis should be dedicated to the stated objective of the study.

Response #48: Author Response:

We will dedicate more analysis to compare pristine versus degraded islands

Comment #49: 964: A measure of diameter cannot be in mm^2. Do you mean basal area calculated from circumference measurements?

Response #49: Author Response:

Comment is correct; we will clarify this methodology followed to determine tree growth.

Comment #50: 1037-1041: The paradox is not well explained, please reword.

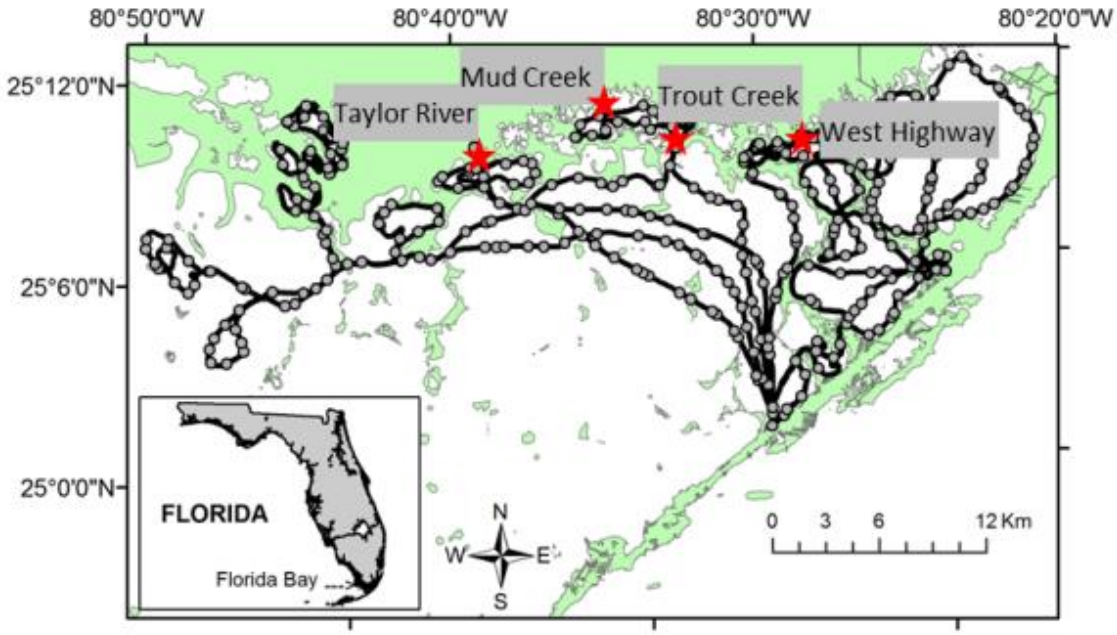
Response #50: Author Response:

We will explain better the paradox.

Comment #51: 1297-1304: The text puts some importance on flow from Trout Creek, but this is not shown on the map in Figure 6-35. Is Trout Creek mislabeled as Joe Bay?

Response #51: Author Response:

Yes, Trout Creek is mislabeled (see below). Trout Creek discharges to/from Joe Bay but this was not made clear.



Comment #52: 1522-1523: The locations of the backfilled canal sections (and other important features influencing the results of the high flow experiment should be included in a location figure.

Response #52: Author Response:

Lines 1522-1523 should be changed from
"as the pocket. Additional constructed features include three 1,000-foot long canal backfill treatments and 3,000-feet of removal of the L-67C levee. Construction of DPM structures and"

TO

"as the pocket (**Figure 6-40**, **top center**). To evaluate the effects of canal backfilling and levee removal, additional constructed features on the L67C canal/levee include three 1,000-foot long canal backfill treatments (i.e., partial, complete and no-backfill treatments) and 3,000-feet of removal of the L-67C levee **(Figure 6-40**, **top center; see also Figure 6-46)**. Construction of DPM structures and"

Comment #53: 1539 (and Figure 6-40: What/where are the C1 and RS1 (and RS2 in later lines)? These are neither identified or located in a figure.

Response #53: Author Response:

Added more info in 6-40 legend text to highlight & explain all sentinel sites that are included in Fig 6-40. Font of sentinel sites increased in map to elucidate site locations.

See also response to #52

Comment #54: 1637: Figure 6:41 does not show results of temporal variation of velocity as indicated in this line.

Response #54: Author Response:

CHANGE LINE 1637 FROM

demonstrate slower speeds on days 2 and 3 (**Figure 6-41**). When judged at a larger scale, the

TO

demonstrate slower speeds on days 2 and 3 (**Figure 6-40 and Table 6-8**). When judged at a larger scale, the

Comment #55: 1654-1658, 1661: Something is missing here. TPP is assumed to mean total particulate P, but this is not stated. Mass of what decreased? How does this contrast to TTP?

Response #55: Author Response:

TPP is defined on line 1557

Comment #56: 1667: Changes of what?

Response #56: Author Response:

Change “dramatic changes” to “dramatic changes in water quality”

Comment #57: 1671: Does construction refer to canal backfilling or something else. A lack of information on what was done at the site hinders the readers ability to grasp the essentials of the discussion in this section.

Response #57: Author Response:

Lines 1671 – 1672 should be changed from

“units (NTUs) at sites in close proximity to construction may also reflect movement of construction materials. Detailed analyses of these data in concert with other sediment”

To

"units (NTUs) at sites in close proximity to **the S-152** may also reflect movement of unsettled construction **material (mainly limestone bedding) around the S-152**. Detailed analyses of these data in concert with other sediment"

Comment #58: 1719: What canal? This section needs some introductory text to put in context with the rest of this study.

Response #58: Author Response:

CHANGE LINES 1719-1721 FROM

"After being intercepted by the canal, the released water was shunted in a southwesterly direction in the canal until the L-67C levee gap was reached where the released water then moved southeast into WCA-3B (**Figure 6-40**)."

TO

"To evaluate movement of water across the different canal backfill treatments, flow velocities were monitored at a number of sites around the L67C (**Figure 6-40 and Figure 6-46**), including sentinel sites in the marshes upstream (sites UB1, 2 and 3) and downstream (DB1, 2, 3) of the L67C canal backfill treatments as well as spot measurements associated with fauna and sediment sampling (**Figure 6-46**). Based on the trajectories of the Fluorescein dye, water moved east-southeast from the pocket into the L67C canal and was then shunted in a southwesterly direction in the canal until the L-67C levee gap was reached. Water then moved southeast into WCA-3B (**Figure 6-40**)."

Comment #59: 1724: What are DB and UB sites?

Response #59: Author Response:

SEE RESPONSE TO #58

Figure and Table comments:

Comment #60: Fig 6-1 through 6-7: Reported data is inconsistent between figures and in some cases not consistent with the corresponding caption. Sometimes upper and/or lower criteria and/or ground surfaces are shown, sometimes not. All graphs should show all important parameters. Note the related comment for lines 163-167.

Response #60: Author Response:

We would like to keep these USGS graphs as they are because they allow the reader to see the detail of the hydrologic ups and downs. They are not all the same because either the data are missing or the hydrology is so extreme as to be irrelevant to the index. WCA-1 does not have an average ground elevation at Gage 9 because the USGS needs to re-

measure it. We maintain an approximation of the peat conservation height in the WCA-1 graph based upon past estimates. WCA-2B does not show ground elevation or tree island tolerance because WCA-2B acts more like a reservoir where water depths are consistently too deep for tree islands and the peat conservation index is never reached. We will however give the ground elevation statistic in the legend and mention the lack of tree islands from now on. The NE Shark River Slough has a unique operational limit indicating extreme fire potential, which is why there is a large gap below the ground elevation height. It also does not have a tree island tolerance criteria because the data for this region are missing.

Comment #61: Table 6-3. The historical range seems to be missing, or is "historical range" and "target" the same thing?

Response #61: Author Response:

This is more a target than a historical range. We have removed "historical range".

Comment #62: Table 6-4: Basal area units are wrong and the unit tree/ ha (in footnote) is not used.

Response #62: Author Response:

We will review the units used in the table.

Comment #63: Figure 6-19: Legends are too small to be legible.

Response #63: Author Response:

Will redo figure to make legends larger.

Comment #64: Figure 6-30: The caption is a mouthful; ("the" in the second should be removed) and the definition of the temporal and spatial medians and "interquartile range" are not provided in the text.

Response #164: Author Response:

Corrections will be made and text will be added.

Comment #65: Figure 6-32: There appears to be no blue region in the graphic as described in the caption.

Response #65: Author Response:

The figure will be redone to include the blue region.

Comment #66: Figure 6-33: What does the dashed vertical line represent? Line legends should be included in the graphic, rather than in the caption.

Response #66: Author Response:

The dashed line indicates the separation of water years. This will be clarified in the caption.

Comment #67: Fig 6-38: The green line is not labeled and the legend (assumed to be species) should be consistent with the text (species rather than genus names). The Y axis (and X axis for that matter) is not labeled.

Response #67: Author Response:

The units for the plot are in the legend but it was cropped in the editing process. The figure will be redone and axes labeled.

Comment #68: Figure 6-40: Is SF_6 sulfur hexafluoride, the dye used in the tests or something else? (It is not defined in the figure caption, but is later in the text.)

Response #68: Author Response:

Figure legend 6-40 revised – see response to #53

Comment #69: Figures 6-41, 6-42 and 6-43: All labels and line weights are too small to be easily read.

Response #69: Author Response:

Agreed. See response #35

Comment #70: Figure 6-43: There is too much information in one graph. Panels are not properly identified and caption does not capture the complexity of the data.

Response #70: Author Response:

Agreed. See response #35

Editorial page and line comments:

Comment #71: 173: ...recession rate of 0.04 foot ***or less*** *for a week…?*

Response #71: Author Response:

We will change line 171 to read:
A red label indicates poor conditions due to recession rates that are too fast (greater than 0.6 foot per week) or too slow (less than 0.04 foot per week for more than two weeks).

Comment #72: 359: common and ***a*** *defining feature*

Response #72: Author Response:

Amended as suggested.

Comment #73: 677: image resolution ***at heights*** *of 91.4 ...*

Response #73: Author Response:

Edit will be made.

Comment #74: 701-743: This introductory section needs editorial help. A couple of sentences are run-ons, and/or contain the wrong verb tense. In some cases (see questions on lines 710, 734) the intent of the authors is lost.

Response #74: Author Response:

Will rewrite to clarify and improve flow.

Comment #75: 1548: ...direction ***were*** *measured…*

Response #75: Author Response:

Agreed.

Comment #76: 1653: …were ~~the~~ identical…

Response #76: Author Response

Agreed.

RESPONSES TO COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 7

LeRoy Rodgers, Mike Bodle, Francois Laroche, Paul Pratt[1], Andrew Derksen[2], Jeff Kline[3], Frank Mazzotti[4], Kristina Serbesoff-King[5], Mike Renda[5], Jenny Ketterlin Eckles[6] Mike Rochford[6] and Joy Vinci[6]

Level of Panel Review: Accountability
Reviewers: P. Dillon

Comment #1: Does the draft document present a defensible account of data and findings for the areas being addressed that is complete and appropriate?

This chapter provides a thorough account of management activities related to eliminating the effects of non-indigenous plant and animal species on the environment of South Florida. Although eradication is the preferred solution, this is often impractical or impossible, and controlling the spread of invasive species may be the most that can be achieved. The report acknowledges that there are many non-indigenous species for which there are no data, but it does seem that attention is given to those with the greatest potential to damage the ecosystem. It appears that the programmes in place have reduced the extent and impacts of several key invaders, although the region is clearly under pressure from a continuous influx of new species.

Response #1: The authors thank the reviewer and concur with the reviewer's implication that scientists and land managers are placing the greatest attention to the highest priority species.

Comment #2 Is the synthesis of this information presented in a logical manner, consistent with earlier versions of the report?

I found this chapter to be well-written, very well-organized and informative. The current status of the most important non-indigenous species is outlined and any control activities that are in place are updated.

Response #2: Thank you

Comment #3 Are findings linked to management goals and objectives?

[1] United States Department of Agriculture - Agricultural Research Service, Davie, FL
[2] Florida Department of Agriculture and Consumer Services, Miami, FL
[3] Everglades National Park, Homestead, FL
[4] University of Florida - Ft. Lauderdale Research and Education Center, Davie, FL
[5] The Nature Conservancy - Florida Chapter, Altamonte Springs, FL
[6] Florida Fish and Wildlife Conservation Commission, Tallahassee, FL

The linkages between the monitoring results and management objectives are very clear. The amount spent ($19 M) on control programmes in one year alone attests to the importance of this issue, as well as to the priority given to controlling these species.

Response #3: Thank you.

Comment #4 Is there any constructive criticism and guidance to offer for the District's large-scale programs?

Biological controls for melaleuca, water hyacinth and old world climbing fern have been introduced. The scientific literature is full of examples where biological control has had unexpected adverse effects. Chemical controls can certainly backfire as well, although impacts of chemical treatments usually are relatively short-lived. Biological controls that have gone wrong can be permanent. Chemical controls, however, would likely be ineffective for some of the problem species, both plant and animal. It is important that extensive studies be carried out before any biological control agent is introduced. Secondly, it is obviously easiest to eradicate or control an invading species at he earliest time od discovery. A commitment and plan to eradicate, if possible, any new species upon discovery would seem to make sense.

Response #4: The authors appreciate the guidance regarding biological and chemical control. The reviewer indicates that there are many examples of unexpected adverse effects of biological control. The vast majority of such cases involve either inadvertent biological control releases or deliberate releases that lacked sufficient host-specificity testing. All current biological control efforts conducted for natural weed management in Florida utilize methods of "classical biological control," which involves intensive risk assessment protocols (including stringent host-specificity testing). This approach has yet to result in unexpected impacts to native species. However, a philosophy of extreme caution is advised, as the reviewer suggests.

The authors also strongly agree that rapid response to contain and potentially eradicate newly discovered species should be emphasized across state and federal jurisdictions.

RESPONSES TO COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 8

Bruce Sharfstein, Joyce Zhang and Lesley Bertolotti

Level of Panel Review: Technical
Reviewers: Dr. Dillon (AA); Dr. Dodds (A)

Comment #1: *The chapter is well-written, concise and easy to follow. The conclusions are supported by the data presented. As was the case last year, the writers have produced an excellent summary of the ongoing work on Lake Okeechobee and its watershed, and have provided a very clear picture of the status of the lake. They have demonstrated some progress towards environmental targets, although others remain elusive.*

Response #1: Comment appreciated.

Comment #2*: In particular, the greatest concern remains the progress, or lack of it, made towards reducing the TP to the target value of 140 metric tons/year. Although there have been substantial efforts to reduce loads, many of which have had significant success, and many of which have cost large amounts, the total phosphorus load is relatively unchanged in WY2014 compared with recent years and the in-lake TP concentration has not improved. In fact, the calculated load was a little higher in 2014 than in 2013; however, this increase is attributable entirely to the higher flows. I suggest that the authors take an additional approach to interpreting loading data. Loading is the benchmark parameter that we all use but its actual importance is that it is directly related to in-lake concentration of P (or N). Using loading as the key parameter has drawbacks, notably it can be driven more by hydrology than by any actual change in land use, technological fixes, etc. I suggest that an equally useful parameter is annual mean volume-weighted inflow concentration; this "corrects" for year-to-year changes in hydrology and has a more direct relationship with in-lake concentration. This can simply be calculated as the total load divided by the total input (or output) of water (corrected for change in lake storage of water). The load from precipitation (35 mt for TP) is not likely going to be reduced; this input of P (and that of N) as well as of water could be excluded from the calculations to see how the sources that can actually be managed are changing from year to year.*

Response #2: Thank you for the suggestion. In the past, Kendall Tau trend analysis of three parameters - mean monthly flow, TP load, and TP concentration - was conducted for the eight sub-watersheds around the lake. Two of the eight sub-watersheds displayed significant decreasing trends for flow and TP loads, one showed significant decreasing trend for flow only, and none revealed significant trends for TP concentrations at $p<0.05$. The District will work closely with the Florida Department of Environmental Protection through their Basin Management Action Plan Program on applying a methodology in future SFER's to track progress towards achieving the TMDL that considers hydrologic variability.

Comment #3*: Overall, this is a well done document and the district continues to make progress on problems plaguing the Okeechobee system. I suggest more statistical analyses of temporal trends, more emphasis on algal bloom sampling, and some biotic index work to get at N versus P effects on biotic integrity.*

Response #3: Comment appreciated. The Lake Okeechobee group is trying to focus more resources on the causes of algal blooms (see section on MODIS satellite imagery) and we continue to perform temporal trend analysis as our data sets grow. However, the size of Lake Okeechobee, the climatic variability of south Florida and our current budget limitations make these challenging tasks.

Comment #4*: Information on the various construction projects including the Stormwater Treatment Area (STA) projects is very nicely summarized in Table 8-1. Most of these projects are proceeding well and appear to be contributing significantly to reducing the P load. Implementation should lead to significant further reductions in P leading to the lake. The HWTT technology is showing much promise for additional reductions in load and should be continued and possibly expanded.*

Response #4: Comment appreciated. The continued expansion of HWTT technology is subject to funding availability.

Comment #5*: As mentioned in the review of the 2013 report, the water quality monitoring and the biological monitoring are well-conceived and appear to be well-executed. It seems that there is more attention paid to the problem of algal blooms than last year, particularly of cyanobacteria, which is good, but more still should be done. The increase in SAV along with the decline of Chara, and the generally good diatom:cyanobacteria ratios are positive signs. The fish and wading bird data indicate recovery moving forward, although slowly, from the effects of severe weather events in past years. One very useful addition to the report in following years would be more information on oxygen levels in the lake. Despite its very shallow nature, the lake is so productive that oxygen depletion needs to be considered. More statistical analyses of temporal trends is definitely warranted, as is some biotic index work to better understand N versus P effects on biotic integrity.*

Response #5: Comment appreciated. Although not generally reported in the SFER, except for DO concentrations at structures reported in the Lake Okeechobee Operating Permit (Volume 3 Appendix 4), we do routinely measure DO as part of every field data collection and have been doing so since field DO instruments became available. Our results indicate that the pelagic zone of the lake is generally well mixed with oxygen concentrations close to saturation, with only very occasional and short term nighttime anoxic events occurring close to the bottom muck layer. The water column in the emergent marsh is generally well oxygenated during the daytime but may become anoxic at night (although we have very limited nighttime data because of the risk of leaving instruments out overnight and the dangers of operating in the marsh after dark). We are planning to collect additional nighttime DO data in the coming year as we are interested in addressing the question of whether the Lake is a net carbon source or sink.

Comment #6*: Line 87. This is an annual flux… if so it should indicate per year in the units here and elsewhere.*

Response #6: This is for unit areal load on an average annual basis. Since this is an annual report, we thought it was clear that the unit was lb/ac per year. Changes will be made.

Comment #7: *line 88 – units are still somewhat strange. If you use lb/acre for yield (which should in fact include a time dimension, i.e. lb/acre/yr), why mix concentrations in metric? If concentrations are in ug/L or mg/L why change to lb?*

Response #7: Again, this is for unit areal load on an average annual basis. It is for comparison among sub-watersheds with different sizes.

Comment #8*: line 129 – this is too important to allow equipment limitations to prevent adequate data collection; the limitations should be remedied in case of a high water year in future.*

Response #8: The authors agree that SAV is a very important ecological parameter. SAV is currently sampled using an oyster tongs like device and unfortunately, it's maximum effective working depth is about 2 meters. However, we recently acquired side scan sonar equipment (see appendix 8-1) and are in the process of evaluating it as a tool for identifying SAV beds at depths greater than those accessible with our standard mechanical sampling device.

Comment #9*: Line 360. Removed P from the basin or sequestered it from the surface water?*

Response #9: It was sequestered from the surface water with STA.

Comment #10: *line 411 – TP loads increased but less so than the flow. Therefore the volume-weighted inflow concentration decreased, and this is important because load is only important in that it is directly related to lake concentration. So if inflowing concentration drops then lake concentrations must drop (barring increase in internal sources).*

Response #10: Agreed. However inter-annual results are so variable that it is difficult to determine whether any downward trend is occurring.

Comment #11*: Table 8.2 and 8.3. Statistical analyses of these data could help indicate if actions are truly having a significant effect and establish confidence bands around the trends. In general it would be good to know if nutrients are being decreased or held steady in the face of increasing loads. With respect to P control, treatment rather than stopping sources is probably not sustainable in the long term.*

Response #11: See response for comment #2.

Comment #12: Tables 8-5 and 8-7 – this is a very nice method of presenting the data graphically. line 576 – these seem like very important data; why was their collection reduced?

Response #12: It was due to budget reductions.

Comment #13*: Table 8.6 and elsewhere, as usual the mixing of SI and American standard units sets me on edge… but I guess it is a necessary evil.*

Response #13: The choice of units considers the regional stakeholder audience as well as the potential international audience. A "Units of Measurement page" with US and SI unit conversions for commonly used units in the SFER will be included as front matter in the final 2015 SFER version.

Comment #14*: Table 8.7 and others, the bars are cool… but the totals row is not really totals, sometimes it is means. If it was always totals then it would always be 100%. As is, this format is somewhat misleading.*

Response #14: Agreed and changes will be made.

Comment #15*: line 584 – Both reviewers have had negative experience with autosamplers; the lines easily become contaminated, and the sample bottles accumulate P on their walls via bacterial and algal formation if left for more than a day. In low nutrient environments they cannot be trusted.*

Response #15: Agreed. The District follows strict protocols on maintaining the deployed autosamplers. The machines are serviced every week and tubing is changed as needed or quarterly at a minimum. We are aware that there can be issues with autosamplers used in the field and we collect grab samples for back up and concentration comparison.

Comment #16: *Line 634 – this is an example where statistical analysis would make a much stronger argument – is TP really lower TP?*

Response #16: See response to comment 10.

Comment #17: *Table 8.10. Clarify if ratios are molar or mass.*

Response #17: Ratios are mass.

Comment #18: *Line 790 – it would help the reader who is not familiar with macrophyte ecology if the report identified which macrophytes (and later, same comment for fish) are considered desirable and which are not. Is this based entirely on exotic vs. not exotic?*

Response #18: For SAV, the annual changes in species composition are typically the result of changes in lake stage and this is elucidated in the text. However, it is difficult to say much about whether any given species is desirable or not. Thus Chara is generally considered a pioneer species and poorer habitat than vascular SAV. However, the presence of Chara is typically a harbinger of improving conditions and is certainly preferable to an absence of plants. Similarly, while Hydrilla is an exotic and may be a nuisance when present at densities sufficient to impede navigation or reduce conveyance at structures it is the preferred food of the exotic apple snail *P. maculata* whose abundance may be a primary factor in the recovery of the endangered everglades snail kite. In the authors' opinion, this level of detailed discussion may not be appropriate for the SFER.

Although there are many exotic species of fish in the Lake, none of them have reached sufficient density to begin appearing as dominant actors in the annual fish surveys conducted by FFWCC. Each fish species plays a role in the ecology of the Lake and the inter-annual changes in species abundance are ecologically significant and frequently indicative of changing lake conditions and trophic interactions. These are clearly elucidated in the SFER text.

Comment #19: *Figure 8-22, what is the x axis? The bars look weird, flat standard rectangle would be easier to interpret.*

Response #19: The x axis is sampling month and year. A label will be added to the x axis and the cylindrical bars will be replaced with standard flat bars.

***Comment #20**: Fig 8-23 – it would be helpful to put what all parts of Box plots are in the legend.*

Response #20: The legend will be modified as suggested.

***Comment #21**: Line - it is hydrologic elsewhere and hydrological here; pick one and stick with it, preferably the former.*

Response #21: The text will be reviewed for consistency and hydrological will be replaced by hydrologic wherever it occurs.

***Comment #22**: Fig 8-24 - what are units on y axis?*

Response #22: The units of the y axis are feet. The graphic will be corrected to add a Y axis label.

***Comment #23**: Line 1109 - these numbers should be reported as per unit effort or they mean little, so stick with the data in Figure 8-28.*

Response #23: Since electrofishing is done each year at the same time, at the same 22 nearshore sites, within an area predefined by the deployment of block nets, and using the same technique, the total numbers and mass of fish caught provide a snap shot of the condition of the fishery.

***Comment #24**: Considering the relative potential for toxic blooms, I am surprised more effort is not going into algal bloom sampling.*

Response #24: The authors' agree. Appendix 8-1 describes an ongoing effort to use NOAA satellite imagery to track algal blooms on Lake Okeechobee; a technique currently being used successfully in the Great Lakes and in a number of Lakes in north central Florida. Non-remote investigation of blooms on Lake Okeechobee is difficult and time consuming due to the lake's large size and the fact that blooms tend to be both spatially and temporally ephemeral. It is anticipated that the use of real time or near real time remotely acquired bloom data to guide field deployments may improve our ability to study blooms and determine the specific proximate environmental conditions that cause them.

***Comment #25**: Line 1295 - are these correlations reported or plotted somewhere? More details would be interesting.*

Response #25: No, although this section could be expanded in next year's report.

***Comment #26**: Line 1311 – there is now considerable information about bioaccumulation of microcystin in fish – is there any monitoring of the fish? And considering the relative potential for toxic blooms, more effort into algal bloom sampling is warranted.*

Response #26: Regarding algal bloom monitoring, see the response to comment 24. The authors' agree that monitoring microcystin in fish (and perhaps in other key food chain components) would be interesting and worthwhile and we will explore the possibility of obtaining funding through FDEP and/or FDOH to do this work.

***Comment #27**: Line 1353 – this table provides interesting information about various projects but it is not given in enough detail to evaluate.*

Response #27: Chapter 8 was reorganized this year to better focus on the chapter's specific mandated reporting requirements. However, many of the projects listed in Table 8-13 are more fully described in Appendix 8-1.

***Comment #28**: Line 1363 - the literature cited is rather modest for a 70 page technical document.*

Response #28: There is relatively little technical literature available on much of the watershed related work reported in Chapter 8. Similarly, most of the ecological information reported in the Chapter reflects routine monitoring using techniques that have been in place for many years and have been described in earlier editions of the SFER; which are cited as references in the literature cited section. Also, since most of the newer in-lake research and development work was relocated to Appendix 8-1, a number of references were likewise relocated to the literature cited section of this appendix.

RESPONSES TO COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 9

David Anderson, Steve Bousquin, David Colangelo, Brad Jones, Joyce Zhang, R. Thomas James, Chris Carlson, Michael Cheek and Lawrence Spencer

Level of Panel Review: Technical
Reviewers: Dodds (AA), Dillon (A)

Dodds (AA) reviewer technical comments.

General Comment 1. This chapter is generally well written and describes an amazing restoration job, one of the biggest ever. It is really commendable the "ecological responses to Phase I of restoration can be found in a recent special edition of the international journal Restoration Ecology dedicated solely to the KRRP". Any time that the research and monitoring of this ecosystem can be published in the peer-reviewed literature, the validity of the project is increased. Such publication should always be encouraged as the peer-reviewed literature is much more likely to survive and serve as a resource to others than reports such as this, which are, while peer reviewed, are classified as grey literature and are not held to the same standards in general.

My largest point here in this review is the lack of attention paid to mechanistic understanding of why low dissolved oxygen might occur. Results are presented without consideration of time of day, and it is well known that the balance between photosynthesis and respiration played off against equilibration via aeration rates plays the dominant role in determining how far from aeration that dissolved oxygen gets, including low oxygen excursions.

General Response 1. We are assuming that in his first sentence the reviewer is referring to the section on hypoxia in the Kissimmee River. The purpose of this section is to reflect the considerable attention that is being given to this issue by KRREP scientists. We appreciate the reviewer's support of the need for enhanced research to address the mechanisms for DO declines. The current section, however, is intended as a report of current status of the District's efforts to address the problem of dissolved oxygen declines. Work has not progressed to the point of proposing, planning, designing, and funding research to explore the mechanisms causing these anomalies. Multiple reasonable working hypotheses (which both reviewers seemed to accept) have been developed and were presented in the chapter. They will be used to guide future investigations. We will clarify in the introductory sentences to this section. INTRODUCTORY SENTENCES WILL BE REVISED.

The second sentence in the reviewer's comment, about the time of day of DO measurements, may have resulted from streamlining the chapter to avoid excessive detail. In the KRREP DO evaluation section, methods will be added to clarify that manual, grab-sample data collected during daylight hours only applies to data used to evaluate components (a) and (b) of the DO expectation. The author of the DO section will revise the text to clarify that this adjustment in

data collection was made to ensure that the data used for expectation evaluations are comparable to the methods that were used in collection of reference data. Components (c) and (d) of the DO expectation are evaluated using data collected at 15-minute intervals, day and night, from stationary DO sondes, as are all of the data being used to explore the DO sag problem. These data are examined both at the original 15-minute timescale and/or may be converted to daily averages, but all analysis except those for the two specialized DO expectation components include night measurements. The reviewer's statements about the balance between Ps and Rs are factually correct but do not seem to raise a specific concern with the chapter. Results from a study of metabolism in the KR were published in Colangelo (2007), and a more recent paper (Colangelo 2014) proposed a conceptual model for KR DO before and after restoration and discusses DO sags and their possible causes. METHODS WILL BE ADDED TO KRREP DO EXPECTATION SECTION

Literature Cited

Colangelo, D. J. 2007. Response of river metabolism to restoration of flow in the Kissimmee River, Florida, U.S.A. Freshwater Biology 52:459-470.

Colangelo, D. J. 2014. Interim response of dissolved oxygen to reestablished flow in the Kissimmee River, Florida, USA. Restoration Ecology 22(3):376-387

General Comment 2. Mechanistic models of these processes informed by empirical data are now possible. The research work in the Everglades demonstrated expertise in the region to work with gas tracers (SF6) and inert solutes (fluorescene) that would be required to assess reaeration rates by habitat. The existence of logging optical oxygen probes provides the technology to get diurnal oxygen signals. These data from multiple points in the system could be combined to get estimates of oxygen dynamics and individual points as well as informing a whole-system model of oxygen fluxes to predict the conditions under which low or high dissolved oxygen conditions could occur.

General Response 2. See response to Dodds comment # 3 below. The dissolved oxygen data discussed and presented in Chapter 9 were obtained from stationary DO sondes, except for the data being used to evaluate components (a) and (b) of the DO expectation, as explained in the author's responses to comments on the DO expectation section. All sondes use technology that was standard at the time the data were collected, incorporating either YSI Rapid Pulse Polarographic sensors or (more recently) YSI optical sensor technology. These data are recorded at 15-minute intervals, day and night. NO CHANGE NEEDED IN TEXT.

Comment 1. line 316. Are there varved sediments anywhere in the area that can be cored to indicate how common anoxic events were historically?

Response 1. line 316. This is an interesting suggestion for establishing a reference condition for anoxic events. Such layered sediments cannot occur just anywhere in the area but would have to occur in the river channel or floodplain to record a depositional history of anoxic conditions within the river. The authors are unaware of varved sediments in the river channel or floodplain based on past studies that made extensive collections of sediment cores of the river channel and have examined floodplain sediments (Warne et al. 2000, Anderson 2014b). - NO CHANGE NEEDED IN TEXT.

Comment 2. As this restoration proceeds and is finalized, is there any provision to plan and modify the project to accommodate future climate change, as is done for the Everglades part of

this document (chapter 6)? We are in a no-analog world, and maybe simply restoring to prior conditions will never be entirely possible.

Response 2. The District acknowledges that pre-regulation conditions may not be fully attainable for the KRRP. Climate change, which is an on-going District-wide concern, is one consideration; exotic species are another and has been dealt with at length in a previous SFER chapter. During the development of the restoration expectations, an effort was made to identify external factors that the project would not address and at least identify these as constraints and where possible adjust the expectation targets. However, reference data are used to derive targets so that the best possible conditions can be attained within the constraints of real-world water operations and climatic conditions. - NO CHANGE NEEDED IN TEXT.

Comment 3. Line 487. This is not a totally true statement as ecosystem scientists have found ways to study phenomena at whole-system levels. There are many sub watersheds that could be analyzed in detail for production of BOD. Also small watershed manipulations may shed further light on questions related to production of low oxygen conditions. Considering how much money is put into the actual restoration, the costs of doing fairly extensive and large scale whole-ecosystem experimentation are not that high, and given that such results are needed to regulate flows in the system to approximate natural conditions, the additional investment would be wise.

Response 3. Line 487. The statement was intended to convey that replication of the conditions occurring in the Phase I area would not be possible in an experimental system, which requires replication. While it is likely that aspects of DO could be studied at whole-system levels, the reviewer's suggestion may not address the problem of lack of replication. The KRRP system is unique in its combination of restored segments of river, partly-completed restoration components, an unpredictably-inundated floodplain, a large extant canal upstream of the project, the effects of several proximate water control structures, and discharge operations intended to meet varying goals including flood control (which is overriding). Funding/staffing for such research is currently and will likely continue to be a challenge. However, as stated in the original chapter the problem of DO declines is a priority and work is in progress to address it. NO CHANGE NEEDED IN TEXT.

Comment 4. Line 529. Option b makes sense, in that it that is probably not outside of the range of natural responses to high rain.

Response 4. Line 529. Is the reviewer referring to #2 at line 529? If so, it is part of a list of "Water management measures that are now being used". The reviewer is correct that it makes sense, as do the others items on the list. NO CHANGE NEEDED IN TEXT.

Comment 5.Line 573. It is somewhat disappointing to see limited post construction monitoring. This is a very important restoration project and one of the general criticisms of wetland restoration has been inadequate post-restoration sampling. Really long term and detailed records are necessary to establish if restorations truly are working.

Response 5. Line 573. The District agrees with the reviewer about the importance of monitoring restoration response and is fully cognizant of the importance of post-restoration monitoring. In fact the District's KRREP has been a pioneer in the field of large-scale ecosystem restoration evaluation since the 1990s and provided the model for other restoration evaluation programs worldwide. A crucial aspect of implementation of long-term, comprehensive monitoring is recognition of the need for cost-efficiency. Times when metrics are anticipated to change minimally can be monitored less intensively to save money and other resources; in this sense

intensive monitoring during the Interim period is "limited" to selected studies that are most immediately indicative of the status of restoration which make the most sense to provide operational guidance prior to project completion. All of the mandated monitoring studies collected baseline data prior to the start of restoration construction, and most also collected several years of Interim data in the Phase I area. The full complement of KRREP studies is planned to be resumed after completion of KRRP for before-after and BACIPS contrast and analysis. The full set of studies is much more comprehensive than the subset that are active in any one year of the Interim Period (which is what is reported in Chapter 9). A partial list is presented in Table 9-3. The criticism cited by the reviewer about "inadequate post-restoration monitoring" has never been directed at the KRREP to our knowledge. KRREP was lauded by the National Research Council as the best documented of Everglades restoration projects (NRC 2009). NO CHANGE NEEDED IN TEXT.

Literature Cited

National Research Council. 2009. Progress toward restoring the Everglades: the second biennial review—2008. The National Academies Press, Washington, D.C.

Comment 6. Line 597 Wow! What a fantastic series of pictures!

Response 6. Thanks! Will be updated for this year in the final draft. WILL UPDATE LINK AND PHOTOS.

Comment 7. Figure 9.10. This figure is difficult to decipher, any better way to show the data?

Response 7. Figure 9.10 summarizes a great deal of information. The authors have not been able to devise a way to simplify it without a loss of information but will continue to work on this for next year's report. NO CHANGE NEEDED IN TEXT.

Comment 8. Table 9.4 Include the number of years total for each, or the number of years met means little. Alternatively the proportion of years the metrics are met could be presented.

Response 8. Table 9.4 Authors will revise the table to address this problem. TABLE 9.4 WILL BE REVISED.

Comment 9.Line 888. Disappointing that so few metrics are being met, but good that there is some improvement. What is the chance that suggestions for the best ways to meet more of the metrics will actually be adopted and be successful?

Response 9. Line 888. The Phase I area to which the Chapter 9 evaluations apply is currently in an Interim status between completion of Phase I construction and completion of all project construction components including implementation of the HRS. Therefore, as indicated elsewhere, during the Interim period the status of expectations is a tool to guide adaptive management rather than an indication of the success or failure of the project. The goals of the KRRP are mandated to be met to the extent possible, and the District and USACE are fully committed to achieving restoration success through completion of reconstruction of the historic habitat template and continued adaptive management of water operations.. NO CHANGE NEEDED IN TEXT.

Comment 10. Table 9.7 and elsewhere. It is a little strange that dissolved oxygen in simply indicated as daytime. The minimum oxygen should be near sunrise and the maximum a bit after noon. Is there any correction for time of day in any of these measurements? Diurnal optical DO sensors are pretty stable and could be deployed to get diurnal swings.

Response 10. All of the existing reference data for components (a) and (b) in the table are from daytime grab samples. Therefore data for these components use daytime samples in order to be comparable with the reference data. The third metric in the table uses 24 hour data. We have recently begun collecting 24 hour data from several of the reference streams and plan on using these data to update the first two expectation components. All other data reported in the chapter are from fixed sondes recording continuously 24/7.

Comment 11. Line 1217: Are there any estimates of error in the cover determinations?

Response 11. Line 1217: Overall map accuracy was estimated at 90%." (LS)

Comment 12: Figure 9-25 Are the post 2010 data significantly different from the baseline data? Seems pretty hard to get a fix on a 2 year baseline when the data are so variable.

Response 12: The post-2010 data has not yet been compared to the baseline data for statistical differences; only whether wading bird abundance is reaching the restoration target on an annual basis based on a three-year running average (see Figure 9-24). See Cheek et al. 2014 for statistical differences between baseline and post-restoration (interim) abundances of both wading birds and waterfowl through 2008. Post-2010 data is planned to be compared to baseline data for significant differences after the Headwaters Revitalization Schedule has been in place for at least several years, if not sooner. True, two years of baseline data is a weak point in the data set, but it is not the source of the restoration expectations, which were developed from earlier data. Also, based on best professional judgment and knowledge of the system, the baseline years were thought to be representative of the wading bird and waterfowl communities in the channelized system by representing two contrasting years with regards to hydrology and climate (1996-1997 = average dry season water levels; 1997-1998= wetter than average dry season (El Nino)).

Comment 13: Figure 9-32. Source and sink is more common terminology, in my experience, to importer or exporter.

Response 13. Figure 9-32: The importer and exporter terminology is consistent with the terminology used in the PN-Budget tool documentation and previous work performed using this tool. Nutrient import and export describe land use activities and their associated nutrient management. The terminology of source and sink are more commonly used in nutrient balance and dynamics studies for water bodies.

Comment 14: Table 9-11. This table does not make sense to me, am I missing something? The land uses that should be the biggest sources are denoted as importers. Does this mean they cause import downstream? If the source-sink terminology is used then the net sources are ones that give off nutrients downstream and those that are sinks intercept nutrients from upstream and let less go downstream. On the other hand, if one is accounting just for inputs and outputs, cropland could be a net importer, because it gets lots of fertilizer and holds back most of it, but the major source of nutrients downstream. I think a conceptual figure of what these numbers mean or some other clarification might help here.

Response 14: Table 9-11.Yes, the land uses with net nutrient import (nutrient import minus export) are the sources with potential to discharge nutrient to the downstream water body. There have been several nutrient budget studies conducted in various regions of the Lake Okeechobee Watershed to identify the sources of nutrients. These studies have indicated that phosphorus imports in the Lake Okeechobee Watershed were primarily in the form of pasture and crop fertilizers and dairy feeds, whereas total P exports were primarily in the form of milk, cows, and crops (Hiscock et al., 2003; He et al., 2014; Hiscock and Zhang, 2014). The following figure can be added if needed to further describe terminology.

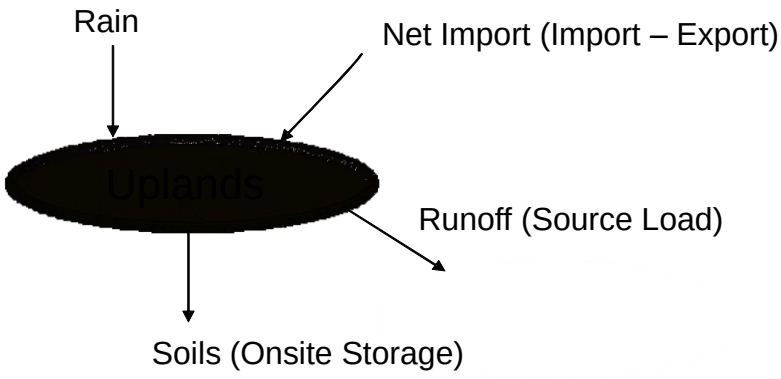


Figure X. Phosphorus budget mass balance components for uplands

References

Hiscock, J.G., C.S. Thourot and J. Zhang. 2003. Phosphorus budget – land use relationships for the northern Lake Okeechobee watershed, Florida. *Journal of Ecological Engineering* 21(1): 63-74.

Hiscock, J.G. and J. Zhang. 2014. Nutrient Budget Model Upgrade, Calibration and Application to the Upper Kissimmee Sub-watershed, Florida. Submitted to Journal of Environmental Informatics.

He, Z., J. G. Hiscock, A. Merlina, L. Hornung, Y. Liu, J. Zhang. 2014. Phosphorus Budget and Land Use Relationships for the Lake Okeechobee Watershed, Florida. Ecological Engineering 64(2014): 325-336.

Dillon (A) reviewer technical comments

General

This chapter provides a clear summary of restoration activities in the Kissimmee River watershed in HY2014. It is well-written and generally concise enough, although there is some repetitious material in the first 10 or 15 pages. The results are quite encouraging even in cases where specific objectives aren't met; in several cases I don't think that it is realistic to expect them to be met at this stage of the restoration activities. For the most part, the work seems to have been very well done and the data analysis and interpretation appear to be sound.

There are a few areas where the report could be improved. I concur strongly with the AA reviewer (W. Dodds) that error estimates for many of the measured or calculated parameters would add substantially to the strength of the report and the arguments that are made.

General Response 1. Error estimates were requested in Dr. Dodds' review only for the cover estimates in the vegetation mapping section. Other data were presented with error estimates. The District response is located in our responses to Dr. Dodds' comments on the vegetation section.

Most importantly, I had also arrived at the conclusion before reading the AA review that the lack of information concerning the reasons for the oxygen declines was the most significant shortcoming of the chapter.

General Response 2. The District agrees that expanded research on the mechanisms and causes of DO declines is needed. The section on hypoxia in this year's Chapter 9, however, was intended as a report of current status of the District's efforts to address the problem; we will clarify this in the introductory sentences to this section. Work has not yet progressed to the point of proposing, planning, designing, and funding potentially long-term research to further explore the mechanisms causing these anomalies. Multiple working hypotheses (which both reviewers seemed to accept) have been developed in the past two years and were presented in the chapter. They will be used to guide future investigations as well to inform Interim operations in the meantime. At the current time, and in advance of results from a more detailed study, the primary topic in the hypoxia section is therefore whether, and if so how, discharge can be better managed to address DO declines based on preexisting data. The information we have gathered is not trivial; in just the past few months, for example, we have seen additional evidence that increases in discharge are followed by declines in DO and decreases in discharge are followed by increases in DO. The opposite relationship between DO and discharge does not occur meaningfully in the period of record. Therefore, we have identified ways to modify operations to control DO response to some extent, and this is really the current topic of the hypoxia section; this approach is classic adaptive management and does not necessarily require an experimentally-verified mechanistic or causal explanation to be applied effectively to real-world operations. Our best hypothesis for this negative relationship between discharge and DO concentration is Hypothesis #1. Additional notes on DO are provided in District responses to both reviewers' comments. The sentence about experimental studies was intended to make the point that replication would not be possible given that the phenomenon occurs in a unique system that is impossible to be represented adequately in any other system. See additional responses for more detail. INTRODUCTORY TEXT TO BE REVISED FOR THIS SECTION.

I have edited my comments below to remove material that is included in the AA reviewer's report.

Comment l. 310 – would it be possible to produce a "natural" hydrograph for comparison, i.e., what expected discharge would be in the absence of management practices?

Response 1. 310. The "natural" hydrograph for the past water year would have to reflect the rainfall for the year. The District does not have the ability to use the rainfall during the past year to predict the resulting stage and discharge in the pre-channelization system. The overall pattern of seasonal and annual discharge can be and has been determined from the pre-channelization discharge and stage hydrographs. This approach was the basis for the hydrologic restoration expectations evaluated in the KRREP Hydrologic Expectations section. - NO CHANGE NEEDED IN TEXT.

Comment 1. 417 – why would increased discharge lead to lower oxygen rather than higher? Is in-channel aeration going to be necessary or is there any chance that this hypoxia will not occur when the new hydrologic regime is established?

Response 1. 417. On lines 495-511, the chapter outlines four hypotheses that relate increases in discharge to declines in DO. It seems likely that care will also be needed in discharge management in the future, after the HRS is implemented. NO CHANGE NEEDED IN TEXT.

Comment l. 433 – in my limited experience with fish, I've seen bullheads that are extremely tolerant of low oxygen, lasting for extended periods in small ponds with<1 mg/L oxygen, even for days at <0.1 mg/L. Because bullheads were included in the fishkill, it suggests that oxygen alone may not be the sole cause. Any chance that another factor is responsible for the fish kill, perhaps something else that is released from e.g. sediments as a consequence of the low oxygen?

Response 1. 433. It is possible that hypoxic conditions either mediate the release of some other factor (possibly from sediments) or act in concert with some other factor to cause fish mortality. While bullheads are generally considered tolerant of low DO, it is also possible that they are less tolerant of a rapid decline in DO as measured during this event (Lines 418-420). None of these possibilities suggests that a change would be needed in the current focus on linkages between water management, hydrology, and DO. - NO CHANGE NEEDED IN TEXT.

Comment l. 497 – these explanations for the low oxygen seem reasonable; should be easy to check at least some of them either with existing data (#3) or by collecting new data. This is such an important factor in the recovery that it needs to be given high priority.

Response 1. 497. As stated in the draft chapter, Hypothesis #3 has already been initially evaluated with existing data (line 503 ff) (new data collection "was designed to evaluate this possibility."). The leading hypothesis is currently #1, but other factors described in the other hypotheses are likely also involved. Hypotheses #1 and #2 may not be mutually exclusive. As also stated in the chapter (l. 488), the problem is considered a high priority. - NO CHANGE NEEDED IN TEXT.

Comment l. 698 – the expectation about seasonal/monthly patterns is not realistic given natural variability in rainfall patterns. Flow management can offset this variability but can't be expected until the new hydrologic control regime is in place. It would make more sense to compare the 2014 HY rainfall pattern to the long-term rainfall pattern and adjust expectations for each year accordingly, at least for the foreseeable future.

Response 1. 698. The reviewer is correct that as originally written, the implication was that the intra-annual part of the expectation should be met every year, and that this is unrealistic. The intent of the paragraph that immediately followed in the original draft (about the inter-annual frequency of occurrence) was to also introduce the among-year occurrence (i.e., frequency of occurrence) at which the within-year metric would be expected to be met. The paragraphs will be rewritten to clarify by combining evaluation of the inter- and intra-annual metrics into a single conclusion about the current status of this expectation. - TEXT TO BE REVISED.

Comment l. 720 – Fig. 9-10 is quite confusing – there must be a clearer way of presenting this.

Response 1. 720. Figure 9.10 summarizes a great deal of information. The authors have not been able to devise a way to simplify it without a loss of information, but will continue to work on the figure for next year's report. – NO CHANGE NEEDED IN TEXT.

Comment l. 889 – realistically, this is all that can be expected at this stage

Response 1. 889. The authors disagree that current status is all that can be expected. Substantial additional improvement in operations is possible during the Interim Period, before the project is fully completed and before the HRS is implemented. Lines 526-531 describe changes to water management operations that have been implemented and have already resulted in improvements. Lines 895-907 describe planned discharge management at the end of the wet season and its anticipated benefits. Staff will continue to adaptively manage hydrology to help meet project goals. Please note that expectation evaluations conducted during the Interim period are intended to indicate the status and extent to which KRRP has progressed in meeting expectations, not to evaluate success at this point per se, which cannot be evaluated until all project components are in place. The reviewer may be interpreting conclusions that the expectations that have not been met are project "failures". However, in the Interim-period expectatioin evaluations being conducted prior to completion of construction and implementation of the HRS, the evaluations are used more as indicators of current status, i.e. they let us quantify our progress in meeting the hydrologic and ecological goals of the KRRP through adjustments in water operations, particularly for expectations and biological metrics that require prolonged floodplain inundation. NO CHANGE NEEDED IN TEXT.

Comment l. 892 – the adaptive management approach is the way to go, at least in the short term where factors such as variability in seasonal rainfall matters

Response 1. 892. The District agrees with this comment and, as stated in the chapter, continues to adaptively manage water operations based on ongoing collection of hydrologic and ecological data, i.e., adaptive management. NO CHANGE NEEDED IN TEXT.

Comment l. 931 – the rationales for decrease in river oxygen levels are not particularly convincing. Until the reason(s) for the anoxic or hypoxic conditions is/are known, there seems to be little chance of improvement. Practices that are useful elsewhere, such as generating passive aeration by e.g. creating riffles are almost certainly impossible in this case. Active aeration is likely unable to handle the high flow rates seen here.

Response 1. 931. The comment is confusing. Lines 931 – 940 describe the reference streams and data, not rationales for low DO. As stated in the hypoxia section, it is possible to reduce the duration and severity of DO sags by careful management of discharge. It seems unlikely that this approach can eliminate them completely. Slowing the onset of hypoxic/anoxic conditions however, is a substantial improvement in that it can allow fish time to adapt physiologically

Comment l. 933 – in what way are these other streams reference streams – do they have no urban or agriculture influence or are they simply unchanneled but with the same potential anthropogenic effects?

Response 1. 933. All reference streams are free-flowing, blackwater streams in south Florida, located within 145 km of each other and within 65 km of the Kissimmee River. Each reference stream has a gradient of less than 6.5 cm/km. Water temperature in these streams range from 21.4 °C to 25.0°C. The reference sites and the Kissimmee River also share comparable water

chemistry. Reference sites were sand-bottom blackwater streams with moderate to low impact from human activity. All but one of the streams are lake fed and all seven flow into lakes. Land use in the watersheds of each of these streams is equivalent to the watershed of the Kissimmee River.

Comment l. 948 – and night? there is a pronounced diurnal cycle with oxygen, although the late part of the night and early morning are usually the time of lowest oxygen levels, so this may be an optimistic picture

Response 1. 948. DO data were collected over the 24 hour day. "All hours of the day" refers to the 24 hour day. Obviously this may be confusing so we will rewrite the sentence accordingly. Please refer to General Response 1 on pages 1-2 for specifics on DO data collection.

Comment l. 969 – this is critical information and I am glad to see that attention is given to this.

Response 1. 969. Agreed.

Comment Line 1021: Autosamplers are known to provide fairly poor phosphorus (and ammonium) data, resulting from fouling of intakes, loss of P to the collection bottles' walls, etc., particularly when samples are not recovered daily. Hopefully the autosampler results will be compared to the grab samples taken at the same time to assess this.

Response 1. 1021: The SFWMD uses autosamplers for many of its monitoring programs and has conducted extensive investigations to assure sample quality. Autosampler monitoring has been determined to be reliable when care is taken to insure that the sample has not been contaminated. The SFWMD follows strict protocols on maintaining the deployed autosamplers. The machines are serviced every week and tubing is changed as needed or quarterly at a minimum. Nevertheless, because issues can occur with these autosamplers, grab samples are also collected for back-up and concentration comparison. When both autosampler and grab samples have been collected from a particular location, data from the autosampler is used by default to estimate phosphorus loading. Although a statistical analysis of autosampler data vs. grab sample data was not done for the Kissimmee River analysis, data were examined closely for certain periods encompassing storm events. No large disparities between the two types of data were found. At S-65, autosampler TP may be slightly higher than grab sample TP for certain periods, but any difference has not been statistically determined. In any case, it is difficult to claim that bi-weekly grab samples provide more accurate data than autosampler data obtained from weekly samples composed of dozens of sub-samples. Both methods have strengths and weaknesses, which is why both of them are employed and why one serves as a check against the other. The investigator agrees that further analysis could be done to compare autosampler data and grab sample data as well as changes in autosampler collection procedures over the years. However, he has confidence in the results and conclusions as they are presented.

Comment Line 1032: Too many significant figures, reduce from 6 to a maximum of 3; same with Table 9-8; this detracts from the reader's confidence in the results.

Response 1032: This comment refers to a statement on the annual discharge at S-65 in WY2014. The discharge value of 765,563 ac-ft is the annual sum of daily flows, many of which are small values. We can rephrase the sentence to be less exact. However, the values in Table 9-8 are being kept as shown to maintain consistency with values presented in Chapter 8.

Comment Line 1033: As always, the mix of metric units with acre-feet appears strange. And later, results are expressed on the basis of square km rather than acres.

Response 1033: The results are reported in units commonly used by scientists, engineers, managers, and stakeholders concerned with South Florida's water resources. For this report, we prefer to use units familiar to users of this information.

Comment Line 1052: TP loads and concentrations are worse in the latter period everywhere except 65E which fortunately is where it matters most, i.e., the load to the lake downstream hasn't increased if I interpret these data correctly.

Response 1052: This is true, although the increases upstream of S-65E, which appear to be due to change at S-65, are important to consider because: (1) the Upper Kissimmee Basin contributes a large amount of phosphorus to Lake Okeechobee, which must be reduced before the TMDL can be met; (2) the increased TP at S-65 appears to be due to local influences near the structure; and (3) higher loads and concentrations from S-65 must be taken into account when the river's ability to assimilate TP is assessed after the restoration project is completed.

Comment Line 1097: There is a great deal of serial autocorrelation in relationships like this when concentrations at one location in a river are related to those at an upstream or downstream site. For this to be meaningful in any way, randomization tests are needed to establish the effects of the autocorrelation.

Response 1097: Autocorrelation- also known as serial correlation - is the similarity of observations in a time series. In the regression shown in Figure 9-17 (to which the reviewer is referring in his comment), there is no time element. The objective of the regression/figure is to show the relationship/correlation between annual flow-weighted mean TP concentrations at S-65 and S-65C. This objective was achieved by regressing the S-65C concentrations (dependent variable) on S-65 concentrations (independent variable). Serial/autocorrelation is not an issue in this analysis because time is not a factor.

Comment line 1428 – excellent!! very happy to see this material in a high quality peer-reviewed journal; it gives strong credibility to the work done

Response line 1428. Thanks!

Comment l. 1578 – I don't understand Table 9-11. The terminology is confusing

Response 1. 1578. Please see responses to Dodds' comments 13. and 14. above regarding Figure 9-32 and Table 9-11.

RESPONSES TO COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 10

Christopher Buzzelli, Kevin Carter, Lesley Bertolotti and Peter Doering

Level of Panel Review: Accountability
Reviewers: Vladimir Novotny

Comment #1: The section on history (pages 10-8 to 10-11) is very informative but it would fit better into Chapters 1 and 2 than in this last chapter.

Response #1: One of the main purposes of inclusion of this section in Chapter 10 is to provide the background of the current C+SF system for the reader before describing how the C+SF project is being restored via current projects and initiatives. However, we can further coordinate with the authors of Chapters 1 and 2 to see if there are areas we can streamline to reduce redundancy.

Comment #2: In contrast, the BAMP plans will rely on mandatory actions and the District and the Florida Environmental Protection Department have been granted authority to initiate Environmental Resource Permitting Program.

Response #2: The authors want to clarify some history of the Environmental Resource Permitting Program (ERP). The current ERP Program became effective on October 3, 1995. This program represents the merging of the former wetland resource permitting (WRP) program from Chapter 403, Florida Statutes (F.S.), with the management and storage of surface waters (MSSW) permitting program in Part IV of Chapter 373, F.S. As noted in the Chapter 10 text there has been some additional rule changes to the ERP program: "Recently the Statewide ERP Rule (SWERP) became effective in October, 2013. The legislative mandate for this rulemaking provided that the individual water management districts maintain their existing water quality rules and their ability to promulgate future water quality rules." However, the authors believe that the reviewer's comment in regards to "granted authority to initiate" may be actually intended for the SFWMD's Chapter 40E-61 (Florida Administrative Code) which has been granted the authority to expand its regulatory boundaries in the Northern Everglades.

Comment #3: *This program and its implementation will have national implications and, if successful as it should be, will serve as an example to other states and help to invigorate the stalled TMDL programs for agricultural watersheds in many states. The recent assessment of the TMDL programs by the US Government Accountability Office concluded that TMDL programs relying only on voluntary participation of agricultural dischargers are ineffective. In Florida, the Department of Agriculture and Consumer Services (FDACS) prepares, with agricultural dischargers, commodity specific water and water quality BMPs in which agricultural and silvicultural (orchards) operators (producers) enroll by submitting a Notice of Intent (NOI) to FDACS, along with an accompanying checklist of the practices applicable to the operation.*

Response #3: The FDACS wishes to note that the "voluntary" Best Management Practices (BMP) Program is actually not voluntary if a Basin Management Action Plan (BMAP) is in place for the area and the BMPs are incorporated as part of the initiatives to achieve the Total Maximum Daily Load (TMDL).

Comment #4: *Currently operators of 40 % agricultural and nonagricultural land area in the Caloosahatchee River watershed and 70% in the St. Lucie watershed received discharge permits.*

Response #4: The authors wish to clarify that the percentages in the comment number 4 refer to Environmental Resource Permits.

Comment #5: Another program for control of nonpoint pollution is the Urban Fertilizer Rule which requires that fertilizer application on lawns and other green urban areas must comply with the statewide rule. This rule was apparently adopted in 2007 but no detail about compliance and success were presented in the 2015 SFER.

Response #5: The Florida Department of Environmental Protection (DEP) notes this is a state model ordinance that is adopted and implemented by local governments. The success of these programs is dependent on the implementation at the local level.

Comment #6: The Florida Department of Environmental Protection also manages the federal program of permitting the discharges from Municipal Separate Storm Sewer Systems (MS4) which requires applying for system wide discharge permits, monitoring the discharges and preparing abatement plans with BMPs. All reissued Phase I permits include a new section on TMDL implementation and require enhanced tracking of load reductions achieved through implementing the permit's stormwater management program including nutrient load reductions from street sweeping activities.

Response #6: The DEP will review the new sections referenced by the reviewer and include references to them where appropriate in the final draft of the Chapter 10.

Comment #7: It is not clear whether or not this Florida program is based on the national more sustainable urban landscape concepts known under the name Low Impact Development (LID) which is a combination of sound hydrologic designs minimizing volumes of storm runoff and quantity of pollution by implementing storage, infiltration, biofilters, roof gardens and many other practices, combined with the aesthetic enhancement of the community (subdivision). Because LID programs have been tremendously successful worldwide, a Manual of Practice specific to Florida should be prepared and made a guide to Florida communities under this program.

Response #7: The DEP is currently funding LID projects across the state to assess the effectiveness of these BMPs.

Comment #8: The biosolids rule, Chapter 62-640, F.A.C, was revised in 2010 which restricts and limits the use of fertilizers on agricultural lands. This legislation requires permitting and nutrient management plans in the Northern Everglades and forbidding lower quality and harmful fertilizers. Last year all sites covered by this legislation are required to be permitted in accordance with the revised rule. A similar rule has been also mentioned in the report for manure management and disposal but details were not reported in the chapter.

Response #8**:** DEP notes that Biosolids use is restricted by Section 373.4595, F.S., and Chapter 62-640, F.A.C. Biosolids land application sites in the St. Lucie River and Caloosahatchee River watersheds must be permitted, have a nutrient management plan, and the applicant for the site must demonstrate no-net loading of nutrients to the site. As of January 1, 2013, no permitted biosolids land application sites exist in either watershed. The only biosolids used in the two watersheds are Class AA biosolids that are distributed and marketed as fertilizer (i.e. under a Florida Department of Agriculture and Consumer Services fertilizer license) in accordance with

Chapter 62-640, F.A.C. Class AA biosolids distributed and marketed as fertilizer are exempt from the biosolids restrictions of Section 373.4595, F.S.

FDACS also notes that agricultural operations located within the Northern Everglades that land apply animal manure are required to follow the requirements found in Chapter 5M-3, specifically 5M-3.004. These provisions do not apply to animal feeding operations subject to permitting under 62-670 F.A.C.

Comment #9: Of interest is the innovative Floating Aquatic Vegetative Tilling lagoon in which high density floating aquatic vegetation will be allowed to develop during growing season and then the water will be released and the plants will be dried and tilled into the lagoon soil. The table does not identify the FAV species.

Response #9: Water hyacinth is used as the FAV in this FAVT system. In addition, each FAV cell contains vegetated earthen berms to help keep the plants in place within the system. The earthen berms have been planted with cattail and *Thalia* and the submerged aquatic vegetation utilized are *Ceratophyllum* and *Utricularia.* This additional information will be added to the Chapter.

Comment #10: The dispersed water management projects listed in Table 10-4 will provide shallow water storage, retention, and detention to enhance Lake Okeechobee and estuary health by reducing discharge volumes and nutrient loading and groundwater recharge. Table 10-4 does not include information on the type of the facility (e.g., lagoon, wetland, infiltration basin, etc.).

Response #10: The current SFWMD categories are also listed in Table 10-4 and in the text of Chapter 10 "The four main categories of projects under the District's DWM Program include storage and retention projects on private lands, storage and retention projects on public lands, Northern Everglades Payment for Environmental Services (NE-PES) projects, and Water Farming Payment for Environmental Services (WF-PES) pilot projects." Overall the current DWM categorization has evolved from describing an initial suite of pilot projects to characterizing the expansion of the program and the land types being used for storage. These land types include ranchlands and fallow citrus lands either publically or privately owned. As the program continues to mature, other land types may be considered for the DWM program in the future.

Comment #11: The results were overwhelming; approximately 900,000-1,300,000 ac-ft (1.11 – 1.6 Km3)of storage was needed in the Lake Okeechobee watershed to help manage lake levels and reduce discharges to estuaries. Additional million acre-feet (1.233 Km3) of storage is needed in the Everglades system.

Response #11: The storage needed north of Lake Okeechobee to help manage lake levels and reduce damaging discharges to the estuaries also depends on the amount of storage provided south of Lake Okeechobee. As stated in the text there have been several analyses with varying assumptions that looked at storage needs and, while the volumes of storage needed north of the lake varied, it is apparent that under any scenario it will be in the order of several hundred thousand ac-ft.

Comment #12: This appears to be the most ambitious program in the nation that will require cooperation of many agencies and stakeholders under the leadership and coordination of the three leading agencies: South Florida Water Management District, Florida Department of Environmental Protection, and Florida Department of Agriculture and Consumer Services. There

are many participating agencies from the US Army Corps of Engineers to Local Governments, to World Wildlife Fund for Nature.

Response #12: The authors thank the reviewer for recognizing the scale and breadth of our current programs and also we wish to thank the reviewer for recognizing the overall effort includes numerous partners.

Comment #13: But the reviewer could not find it the text of the chapter who is the actual leader and how the efforts will be coordinated. This effort may need a special coordinating entity with a director, department heads and liaisons to the key player and executors of the tasks otherwise the efforts will be fragments. The same may be true for the efforts being conducted in the EPA. Is the District this coordinating agency? Where is the organization chart? Who is in charge and who are the leaders?

Response #13: The Northern Everglades Program is a cooperative effort, and the responsibilities of each of the Coordinating Agencies are defined in the Northern Everglades and Estuaries Protection Program (NEEPP, Section 373.4595, F.S.).

Comment #14: The chapter is very detailed and the reader is overwhelmed by hundreds (what it seems) of acronyms and abbreviations, some of them unidentified, some identified dozens of pages before and it takes an effort to identify what all these letters mean. A good remedy would be to periodically spell out the acronyms which will be featured on the page and two or three subsequent pages again.

Response #14: While there is an overall list of acronyms in the front of SFER, the authors will review the document and apply the recommendation to spell out terms where appropriate to optimize the readability of the chapter.

Comment #15: The chapter uses US units, almost solely limited to acre-ft. This unit was identified at the beginning of the section and it probably may not be needed to put metric equivalent at every time it appears in the text.

Response #15: The authors will review the chapter and attempt to reduce the redundant use of the metric equivalent.

Comment #16: (Note the salinity unit should be identified when it first appears in line 1181)

Response #16: The authors have salinity as a dimensionless ratio (per Millero 2010; see Lines 1218-1219).

Comment #17: One immediate observation is that these long sections are identical in format (not an impediment), include word-by word repetitive text and identical figures but with different data. This high repetitiveness could be avoided in the final editing. For example sections on rainfall could be unified with data combined in tables with two columns, one for SLE, the other for CRE and figures for both water bodies. The same applies to sections on Methods, Inflow, averages and maybe others. For example, the long term flow contributions and percentages of flow from Lake Okeechobee could be combined in one table.

Response #17: This is a good suggestion by the reviewer that would help streamline the document. However, the document must satisfy many different stakeholders. For example, some people are concerned primarily with the St. Lucie Estuary and others focus on the Caloosahatchee. Additionally, the report must satisfy a wide knowledge base. While this may

create somewhat redundant information, the author's goals are to customize the report for different interests and level of understandings.

Comment #18: The report identified the ratio as 4.9/1 but in any case this ratio indicates that the estuary eutrophication could be nitrogen limited but the watershed measures to reduce nutrient inputs should focus on both nutrients.

Response #18: The text was clarified to explain that inputs from the St Lucie watershed are comparatively enriched with TP (Lines 1393-1395). This creates the possibility that the estuary could be nitrogen limited.

Comment #19: These values may be misleading because they apparently represent the annual averages and not the concentrations during the periods preceding and during algal blooms. Indeed, Figure 10-20 shows that Chl-a in the upstream profile HR-1 exceeded periodically 60 μg/L which would indicate algal blooms. The species of algal blooms were not identified in the text.

Response #19: The document is a combination of an annual report to describe patterns over the past water year (SFER) and a three-year update of the River Watershed Protection Plans (RWPPs). The RWPPs are intended to provide a longer-term summary of inflows and attributes for the watersheds and estuaries. Thus, average annual chlorophyll a concentrations are provided. The data summary in this report was not intended to quantify the mechanisms leading to algal blooms. The taxonomic composition of the phytoplankton community was not monitored.

Comment #20: The effect of fresh water input on the CRE is more pronounced than that for SLE.

Response #20: The authors are hesitant to make such a statement for several reasons. One reason is the general purposes of the report are not focused on providing comparative analyses of inflows, nutrient loads, salinity patterns, and estuarine water quality between the estuaries. A separate published study (Buzzelli et al. 2013 Seasonal dissolved inorganic nitrogen and phosphorus budgets for two sub-tropical estuaries in South Florida. *Biogeosciences*, 10:6721-6736) compared seasonal inflows, loads, and biogeochemical responses of the estuaries. Secondly, it is clear that freshwater inflows are important to the ecology of both estuaries. However, the timing magnitude, and composition of freshwater inflow to each estuary vary with regional rainfall patterns, the secondary canals particular to each in coastal watershed, and occasional releases from Lake Okeechobee. Finally, the effects of freshwater input can be examined different ways. For example, because the St. Lucie Estuary (SLE) is much smaller (Caloosahatchee Estuary, CRE = 2.5* larger than the SLE), freshwater inflow and nutrient loading can lead to much more rapid responses. Finally, while the SLE has experienced repercussions from extreme inflow in the wet season, the CRE is more impacted by reduced inflow in the dry season.

Comment #21: The long term N/P load ratio detected from Figure 10-30 was 10/1, still borderline as to the limiting nutrient. Annual averages of the Chl-a in the 2012-2014 three year period were the highest in the middle CSO4 station (Table 10-9) and during wet seasons were as high as 80 μg/L (Figure 10-32) in the upstream CSO1 which could indicate algal blooms.

Response #21: The CRE is much more sensitive to the N inputs with P inputs having reduced influence (Buzzelli et al. 2013 Seasonal dissolved inorganic nitrogen and phosphorus budgets for two sub-tropical estuaries in South Florida. Biogeosciences, 10:6721-6736). There was an algal bloom in the upper CRE in April 2011 when there was no freshwater inflow and water temperature was increasing. The data summary in this report was not intended to quantify the

mechanisms leading to algal blooms. The taxonomic composition of the phytoplankton community was not monitored.

Comment #22: The authors of this section developed a very good reporting protocol and graphics that will also be useful for future reporting and following the progress in improving water quality and biota of the estuaries.

Response #22: The authors appreciate the positive comments provided by the reviewer. The graphics and supporting text resulted from a highly coordinated effort among several key individuals with extensive knowledge of the watersheds and estuaries. The figures went through many revisions for presentation to a variety of different readers and stakeholders.

Comment #23: However, as stated several times in this review the water quality management and remediation programs in the watersheds are just beginning or even still in planning phases. Initiation of the programs is lagging behind the ongoing programs similar programs in the Lake Okeechobee watershed and in the Everglades Protection Area.

Response #23: The authors acknowledge that in general, programs in the Lake Okeechobee watershed and Everglades Protection Area have been in place longer than the River Watershed Protection Plan watersheds. Expanding the Lake Okeechobee Protection Act in 2007 to include the Caloosahatchee and St. Lucie watersheds as the Northern Everglades and Estuaries Protection Program (373.4595, Florida Statutes) enhanced protection and restoration of these critical areas.

Comment #24: It is, therefore, paramount that the TMDL document is rapidly updated by a better model and the planned remedial action included in the BMAPs are immediately initiated in an adaptive management scheme.

Response #24: The DEP is updating the Caloosahatchee TMDL concurrent with the first phase Basin Management Action Plan (BMAP). The following language is from the Caloosahatchee Estuary BMAP that describes that process: "During the course of developing the BMAP, concerns were presented by various stakeholders with regards to portions of the TMDL. The TMDL is scheduled to be refined over the next few years. While the TMDL modeling is refined, DEP requested that the stakeholders provide activities and projects that would begin reducing the TN load." (please see page 3, http://www.dep.state.fl.us/water/watersheds/docs/bmap/caloosa-estuary-bmap-final-nov12.pdf).

Comment #25: The last section then describes in detail the projects and actions already described in the Sections Pollutant Sources Programs (p. 10-19) and Watershed Efforts (p.10-23).There are some repetitions between these sections and the concluding section.

Response #25: One of the main purposes of this section (Strategies Moving Forward) is to give the reader a view into upcoming restoration projects and initiatives. For example a reader in a certain watershed may want to track the progress of a project(s) until the next RWPP update. However, the author's will review this section and ascertain if there are areas where redundancy with previous sections can be minimized.

Comment #26: These actions are cost shared between the operators and FDACS. The problem may be the level of funding that would provide enough incentive to the operators to participate in the program. FDACS apparently has only $ 3 million annually for cost sharing. Consequently, only about 55 percent and 71 percent of the acreage classified as agricultural land use in the St. Lucie and Caloosahatchee watersheds, respectively, are enrolled in the FDACS BMP program which may be considered as insufficient.

Response #26: FDACS report the enrollment in the Caloosahatchee increased from 44% in 2012 to 71% in 2014. In addition, please note that these enrollment numbers are based on land uses. It was noted with these enrollment figures that these numbers may not accurately reflect the true amount of agricultural land being captured in the FDACS BMP Program.

Comment #27: Indeed, the level of participation has not changed much since the last year report and the FDACS has requested to increase the level of funding to $10 million/year. Increasing the level of cost–sharing should be considered with a caveat. Implementing BMPs will bring significant economic and social benefits to the farmers. Hence, education of farming operators about the benefits is paramount

Response #27: The authors request the reviewer to please provide clarification on what type of education he is referencing. The FDACS BMP Program is a statewide program with dedicated field staff located throughout the state. Field staff meets with each producer to educate them regarding our BMP Program and to work with them to identify the BMPs that are appropriate for their properties. Our involvement with the producer does not end with the initial field visit. Field staff follows up with each producer within 90 days of the assessment to determine if there is any additional information that we need to provide.

FDACS also has dedicated staff in the Northern Everglades to perform Implementation Assurance visits to ensure that the producers are implementing the BMPs that are appropriate for their operation and are maintaining and structural BMPs that were implemented using cost share assistance. These site visits are documented in the producer files and information regarding implementation assurance is provided in an annual report. In addition to the $3 million requested and received this fiscal year, FDACS also received an additional $10 million in funding to implement larger scale water storage/reuse projects. For the 2015-2016 fiscal year, FDACS will request $15 million for these large scale projects in addition to our normal $3 million cost share request.

Comment #28: There is no doubt that all efforts (1) Pollution prevention and protection of the Everglades Protected Area, (2) Lake Okeechobee pollution prevention and restoration, and finally (3) Northern Everglades program encompassing the St. Lucie and Caloosahatchee watersheds and water bodies are the largest most comprehensive and ambitions pollution control and ecological restoration program today in the world.

Response #28: The authors again thank you for recognizing the scale and breadth of our current programs and also we wish to thank you for recognizing the overall effort includes numerous partners.

Comment #29: The data presentations in tables and graphics were excellent but authors should make sure that lettering some reduced figures is legible.

Response #29: The authors will review the tables and figures to ensure focus and clarity. The figures, tables, and text referring to the figures and tables were checked for consistency.

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RESPONSES TO PUBLIC COMMENTS ON THE DRAFT 2015 SFER – VOLUME I

This section of the responses to comments is provided in response to the public comments on the draft 2015 SFER (Volume I, Chapters 3A, 4, 5B, 8, and 10, and Volume III, Appendix 3-1) received from Dr. Gary Goforth, posted on the SFER WebBoard on October 22, 2014 (see Appendix 1-2, *Public Comments* section).

These public comments are organized by chapter/appendix and provided on the following pages verbatim as posted on the WebBoard for reference. After Dr. Goforth's comments on each chapter/appendix, the authors have provided their section-specific responses for the 2015 SFER. There is another dimension to these responses, however, in that many of Dr. Goforth's points on the 2015 SFER have been raised before over the past year and the District has provided an integrated response in a letter to Dr. Goforth dated May 2, 2014. For convenience, the District's integrated response is attached first and is cross-referenced by authors in their responses to comments that follow section by section, as appropriate. While the District recognizes that these responses to comments are more intricate than usual, placing these materials together in this SFER appendix is intended to help further improve communication and understanding for all readers.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

May 2, 2014

Dr. Gary Goforth, P.E.
10924 SW Hawkview Circle
Stuart, Florida 34997

Dear Dr. Goforth:

Thank you for your ongoing interest and support for improved water resource management in South Florida. We at the South Florida Water Management District (District) fully share in this goal and appreciate the time you have taken to document numerous suggestions and also to speak at the Water Resources Advisory Commission (WRAC) meeting on March 6, 2014. We also appreciate the additional input and open technical discussion of the issues at our meeting on April 16, 2014.

District staff has carefully reviewed your suggestions regarding the 2013 wet season operations as well as your ideas for future operations to reduce Lake Okeechobee regulatory discharges to the estuaries. Optimized lake management remains an ongoing challenge that is made especially difficult during periods of record-breaking rainfall, as we saw last summer.

This letter and the attachment are intended to address the suggestions you brought forward and to clarify steps that the District is taking to move water south and reduce, wherever possible, lake releases to the coastal estuaries.

Fundamental to this issue are the authorized purposes, established operational protocols and limited flexibility of the Central & Southern Florida Flood Control (C&SF) Project as well as the U.S. Army Corps of Engineers (USACE) Lake Okeechobee Regulation Schedule 2008 (LORS 2008). In addition, several significant policy and legal issues relate directly to this topic.

Dating to the 1940s, the C&SF Project was designed to provide flood protection to vast areas of South Florida. It was recognized at the time that regional flood control would cause negative impacts to the east and west coast estuaries. In the 1990s, federal and state agencies as well as local governments and key stakeholders committed to improving environmental conditions across the region. Together they developed the Comprehensive Everglades Restoration Plan (CERP), a multi-project, multi-decade effort that was authorized by Congress in the 2000 Water Resources Development Act. Implementation of the CERP projects will provide significant environmental benefits to South Florida's ecosystem, including the coastal estuaries. Notably, CERP will vastly

increase water storage and conveyance options to water managers, and will provide benefits which can never be achieved solely through operational changes to the existing C&SF Project system.

South of Lake Okeechobee the District operates 57,000 acres of Stormwater Treatment Areas (STAs). These wetland treatment facilities are designed to receive stormwater runoff from the Everglades Agricultural Area (EAA). A number of significant scientific, legal and operational constraints prevent the District from using the STAs primarily as treatment facilities for the lake's regulatory discharges. These constraints include, for example, the obligation to provide drainage to the EAA, STA total phosphorus (TP) discharge limits, canal conveyance capacity, STA treatment capacity, water levels in the downstream Water Conservation Areas (WCAs) and overall rainfall conditions across the region.

Stormwater runoff from the EAA has priority for conveyance south of the lake. The current flood control operations for the EAA directs stormwater to the Everglades through the STAs. This has reduced the frequency of flood control pumping from the S2 and S3 basins into Lake Okeechobee. This is part of the federally authorized operation for the C&SF Project system, documented on pages 7-16 in the *C&SF Project Master Water Control Manual—Lake Okeechobee and Everglades Agricultural Area*.

One of the operational suggestions you brought forward is that the first 250,000 acre-feet of Lake Okeechobee regulatory discharges should be directed south. While the 1994 conceptual design for the STAs did include an allowance for 250,000 acre-feet of lake regulatory discharges to be treated in STA-3/4 on a long-term average annual basis, operational considerations and experience with STA performance have changed considerably in the past 20 years.

Furthermore, from a regulatory perspective, the performance requirements of the STAs also have changed, becoming more stringent. In 1994, the STA outflow water quality target was 50 parts per billion (ppb). Currently, discharges from the STAs are governed by a Water Quality-Based Effluent Limit (WQBEL) target of 13 ppb. Because the STA discharges do not yet comply with the WQBEL (and are not expected to achieve compliance until the Restoration Strategies projects are completed), the District operates in the interim under a legally binding consent order that mandates the District to operate and maintain the STAs in an effort to maximize reductions in TP concentrations to the Everglades Protection Area. *(Reference: Consent Orders: OGC No.: 12-1149, FDEP EFA Permit No.: 0311207; OGC No.: 12-1148, FDEP NPDES Permit No.: FL0778451-001-GL7 A/ RA)*

Numerous STA design studies since 1994 have validated the necessary inflow constraints regarding lake regulatory discharges resulting from the significant change in the STA outflow water quality target. As a result, the 250,000 acre-feet allowance has

been reduced to approximately 60,000 acre-feet of lake regulatory discharges on a long-term average annual basis.

In addition to the attachment to this letter, another source of technical information on the operational aspects of the STAs is detailed in the October 2013 report: *Assessing the Capability to Discharge Excess Lake Okeechobee Water South: Review of System Operations (January through mid-June 2013)*, found online at this link: http://www.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/final_lake_okeechobee_jan_jun_operations_report_2013.pdf

In summary, thank you again for your commitment and interest in solutions that can benefit the St. Lucie Estuary and Indian River Lagoon. In partnership with state and federal agencies, local governments and involved stakeholders, the District continues to focus on implementing both near-term and long-term efforts that will provide tangible benefits to these valued water bodies.

Sincerely yours,

Jeffrey R. Kivett, P.E.
Division Director
Operations, Engineering and Construction Division
South Florida Water Management District

c: Governing Board Members
Carolyn Ansay, SFWMD
Terrie Bates, SFWMD
Daniel DeLisi, SFWMD
Deb Drum, Martin County
Lt Col Thomas Greco, USACE
Blake C. Guillory, SFWMD
Kurt Harclerode, Lee County
Jim Jeffords, USACE
Lennart Lindahl, SFWMD
Temperince Morgan, SFWMD

SFWMD responses to technical questions and suggestions:

- **Prepare a 2013 Wet Season After-Action Report**

  Reporting is an important component of the District's water management and environmental restoration missions. Each year, activities associated with the Kissimmee Basin, Lake Okeechobee, the Everglades and South Florida's coastal ecosystems are documented by the District, in cooperation with the Florida Department of Environmental Protection, in the South Florida Environmental Report (SFER). The SFER unifies dozens of mandated reports and plans into a single document, including the reporting requirements of federal and state-issued permits.

  Because the above-normal rainfall in the summer of 2013 falls within Water Year 2014 (May 1, 2013–April 30, 2014), operations during that time will be covered in next year's SFER, to be published March 1, 2015. Each year the SFER also shows the trend of recovery in Lake Okeechobee, the Everglades and South Florida's coastal ecosystems from past significant hydrologic events, such as the 2004 and 2005 hurricane seasons. Operation of the C&SF Project system is found in Chapter 2 on hydrology.

- **Assess impacts to Outstanding Florida Waters impacted by wet season discharges**

  Monitoring the Outstanding Florida Waters (OFWs) is a shared goal of the District, state agencies and local communities. In Martin County, water quality in the St. Lucie Estuary and adjacent Indian River Lagoon has been monitored on a routine basis since 1990. Currently, 14 different water quality parameters are measured at 13 stations in the St. Lucie and 13 stations in the IRL. Sampling stations are located in waters adjacent to or within the Hobe Sound National Wildlife Refuge, St. Lucie Inlet State Preserve, the Jensen Beach to Jupiter Inlet Aquatic Preserve and the Indian River-Vero Beach to Ft. Pierce Aquatic Preserve.

  In addition, water quality and flows have been monitored at water control structures on the C44, C23, C24 and C25 canals since 1979 and at the Gordy Road Structure on Ten Mile Creek since 1999. The information generated from these monitoring programs allows the District to quantify nutrient loads both from local basins and from Lake Okeechobee and to track the resultant water quality in the St. Lucie Estuary and Indian River Lagoon. Periodic summaries of the data appear in the South Florida Environmental Report (Chapter 10 or 12, depending on the year).

  The Holey Land Wildlife Management Area and Rotenberger Wildlife Management Area (WMAs) also have OFW status. The District works in cooperation with state agencies to protect these two sites. The Florida Fish and Wildlife Conservation Commission (FWC) is responsible for managing wildlife and habitat there as well as in the Everglades and Francis S. Taylor WMA (WCAs 2A, 2B, 3A and WCA-3B). In 2013, the FWC closed these WMAs to the public from July 19 through October 18 because of high-water conditions (exceeding 2 feet in depth), which stresses wildlife and damages habitat.

  Similarly, the Miccosukee Tribe closed its lands to public access over the same period. This was the second year that both FWC and the Miccosukee Tribe closed their lands to public access because of high water levels. During those two years, high water caused stress-induced deaths of several dozen deer and heavy over-browsing. All fur-bearing upland species were stressed by these conditions. Hunting seasons were cancelled as a result of these high-water events.

  Other impacts of high-water conditions in these WMAs included degradation of wildlife habitat on tree islands, including tree islands that were being restored and improved by FWC. Typically, high

water early in the wet season stresses or kills recently planted trees and shrubs on Everglades tree islands (generally planted every May). In 2013, high water depths were exceeded in northern WCA-3A, WCA-2A, Holey Land and Rotenberger for 3 months and for more than 6 months in southern WCA-3A.

- **Sponsor an Emergency Management Workshop to develop operational protocols**

  Although heavy rainfall in 2013 generated a public perception that the water management system was not managed appropriately, operations conducted during the 2013 wet season were in accordance with existing legal and regulatory authorities in the LORS 2008 EIS and USACE Water Control Plan. This LORS 2008 regulation schedule was developed with extensive stakeholder input and included the evaluation of a wide range of rainfall conditions. While the 2013 wet season was very wet, it was, in fact, within the modeled conditions upon which the operating rules were developed.

- **Request the U.S. Army Corps of Engineers to prepare an updated risk assessment for the Herbert Hoover Dike**

  The District shares with many stakeholders a strong interest in the U.S. Army Corps of Engineers' rehabilitation work on the Herbert Hoover Dike (HHD). The USACE is in the process of updating the HHD Risk Assessment and undertaking a Dam Safety Modification Study. One likely outcome of this study will be renewed public discussion on the lake's ability to safely hold water at higher stages.

- **Work with the USACE to re-evaluate the Lake Okeechobee Regulation Schedule**

  As mentioned above, the USACE is in the final stages of completing an updated risk assessment for the HHD around Lake Okeechobee. Following completion of the risk assessment, the USACE will determine the next steps in their efforts to rehabilitate the Dike.

  The outcome of their analysis may include re-evaluation of the Lake Okeechobee Regulation Schedule. If this is the case, District staff will be actively involved—as we have in the past—with the USACE's development of a new schedule for lake operations.

  In preparation, the District welcomes ideas and suggestions on performance measures and other criteria that could be used to evaluate the lake schedule performance. As always, the Lake Okeechobee operating schedule will seek to balance the multiple and sometimes conflicting project purposes.

  The District has been in ongoing discussions with the USACE to develop additional guidance to improve performance within the limited flexibility of the current LORS schedule. This could consist of developing the necessary details of the "make-up water" provision for safety of the Herbert Hoover Dike as well as developing guidance for recommending specific regulatory discharge amounts within the medium and high operational bands.

- **Obtain regulatory relief from the Migratory Bird Treaty Act**

  Legal protection of migratory birds is an important federal law dating back almost a century, but it is also a recognized constraint on operation of the STAs and the C&SF Project system. In 2008, the District, in cooperation with the U.S. Fish and Wildlife Service (USFWS), finalized an Avian Protection Plan for the Everglades STAs focusing on black-necked stilts (*Himantopus mexicanus*) and Florida burrowing owls (*Athene cunicularia floridana*). These two species are afforded protected status

under the Migratory Bird Treaty Act (MBTA) of 1918. Additional protected status has been given to the burrowing owl because it is also listed as a species of special concern in the state of Florida.

The Avian Protection Plan provides the District with a framework to modify STA operations in order to minimize impacts to active nests of either species. This is accomplished by diverting water around STA treatment cells with nests or by regulating inflow to these cells to avoid raising water levels and thereby flooding nests.

The District is currently discussing potential options for relief under the MBTA with the USFWS at the state, regional and Washington, D.C., levels.

- **Request that the USACE begin design for a new regulatory outlet structure on the south end of Lake Okeechobee**

  As part of the CERP, the District and the USACE are scheduled to evaluate infrastructure changes that will allow additional water deliveries from Lake Okeechobee into the treatment areas south of the lake. One feature already identified is improvements needed to the North New River and Miami Canals as well as to the Bolles Canal.

  As part of the recent Central Everglades Planning Project (CEPP), the need for additional capacity to move water from Lake Okeechobee to the project features was investigated. However, due to water quality constraints and the size of features in CEPP, there was not a requirement for infrastructure expansion as the build out of the A-2 Flow Equalization Basin (FEB) was sufficient. It is anticipated that as additional CERP projects are developed, there may be the need for additional capacity to move water to those features. It should be noted that CERP relied on considerable ASR capacity. The development and sizing of a cost effective ASR system for Lake Okeechobee was delayed due to concerns over a potential fatal flaw of arsenic liberation by the dissolved oxygen in the injected surface water. Some of the CERP test wells and other municipal wells exhibited short term release of manageable levels of arsenic during the initial recovery cycles but not in later recovery cycles. Because of its higher operation cost, ASR is not expected to be as large as originally envisioned in CERP yet there may be opportunities to associate ASR with the reservoirs or FEBs and use the seepage from the reservoirs or FEBs to reduce the ASR treatment costs. The final Technical Data Report for the CERP ASR program is under preparation.

- **When the LORS 2008 schedule suggests "up to maximum releases to the estuaries," look for opportunities to hold the water from entering the Lake and increase the amount of water stored in the EAA**

  During the 2013 wet season, the District used its Dispersed Water Management program and several temporary measures to store limited excess water and help to reduce the volume of water released from Lake Okeechobee to the estuaries. Over the longer term, more storage and treatment facilities need to be added to the water management system to reduce damaging discharges to the estuaries, both from the lake and the local watershed.

  Modeling scenarios developed for and presented at the March 6, 2014, WRAC meeting demonstrated that in order to achieve a meaningful reduction in lake discharges to the estuaries within the current C&SF Project system, several significantly adverse impacts would occur across the region, including:

  (1) Flooding of private property;

(2) STA vegetation damage, reduced treatment performance and potential violation of the federal Consent Decree;

(3) increased water depths in the WCAs and potential reduction in marsh vegetation, damaging flooding of tree islands and harmful impacts to wildlife, including threatened and endangered species;

(4) increased risk of WCA and East Coast Protective Levee failure; and

(5) liability for disregarding existing operating rules and regulations.

The analysis further concluded that significant inflows from local basin runoff alone was enough to lower estuarine salinities, causing oyster mortality and die-off of salinity-sensitive grasses.

These modeling scenarios also determined: (1) the magnitude of the problem, (2) that operating changes alone cannot solve the problem, and (3) that storage projects—including Kissimmee River Restoration, CERP, CEPP and the Governor's Restoration Strategies Plan—are necessary and positive steps toward increasing system storage and treatment.

Since last summer's wet season (May 1, 2013, through April 23, 2014), the District has been able to discharge over 175,000 acre-feet of Lake Okeechobee regulatory releases through the STAs to the WCAs when the WCA water levels were below their respective regulation schedules. During the 2013 wet season alone, 72,000 acre-feet were discharged to or through the WCAs, and the District moved water south to tide. The District also worked closely with public and private landowners and land managers to store water where opportunities were available, storing an additional 6,640 acre-feet on public pre-project lands or on private lands through emergency pumping agreements, in addition to the approximately 47,900 acre-feet of existing water retention/storage provided through cooperative agreements, interim lands or environmental services projects.

- **Move more water south to the WCAs and STAs to prevent flows to the estuaries by setting a target of 250,000 acre-feet of water south before discharging to the coasts, suspend normal STA operations, store water in Holey Land and Rotenberger Wildlife Management Areas, send water to the WCAs even when over their regulation schedules, meet the 28% increase in flows south required by the EAA, and remove all flow restrictions into Everglades National Park**

Working with our local, state and federal partners, the District is developing short- and long-term solutions for achieving the shared goal of moving more water south from Lake Okeechobee to the Everglades instead of releasing it to the coastal estuaries. At present, the quantity and quality of water that can be sent from the lake to the WCAs is constrained by several factors, including permits, consent orders and water control schedules and conveyance capacity.

Lake regulatory discharges are made to the WCAs when LORS 2008 guidance recommends doing so, provided EAA canal capacity exists to convey water without flooding basin lands, and when the STAs can treat Lake water and when the WCAs can accept water, i.e., "*when desirable or with minimal Everglades impacts*."

Water control plans and regulation schedules have been established for the WCAs and the Holey Land and Rotenberger WMAs to protect wildlife and wetland habitats from damaging water depths and to ensure the integrity of perimeter levees. The District operates in accordance with these water control plans.

In moving water to the WCAs, the District also attempts to avoid harming the STAs, which were designed and constructed to treat agricultural and urban stormwater before entering the Everglades. While the 1994 Conceptual Design for the STAs included an allowance for 250,000 acre-feet of lake regulatory releases to be treated in STA-3/4 on a long-term average annual basis, this was when the outflow water quality target was 50 ppb. As mentioned earlier, the target today is 13 ppb. Numerous more recent STA design studies and documents recognize this significant change. Furthermore, the 1994 version of the Everglades Forever Act and its underlying assumptions were substantially modified by incorporating the Long-Term Plan, which was modified again in 2013 by the State's Restoration Strategies Plan. As a result, the 250,000 acre-feet allowance has been reduced to approximately 60,000 acre-feet of lake regulatory discharges on a long-term average annual basis.

Even with this constraint on sending Lake regulatory release volumes through STA-3/4, the District discharged over 175,000 acre-feet of Lake Okeechobee regulatory releases through the STAs then to the WCAs over the past 12-months (May 1, 2013, through April 23, 2014). These discharges continue today.

The District currently operates the STAs under a consent order entered into with the Florida Department of Environmental Protection that mandates that the District maximize phosphorus concentration reductions while additional Restoration Strategies projects are constructed and the Science Plan is implemented. For this reason, efforts to move lake water south through the STAs must be implemented carefully to avoid negative impacts to STA vegetation health and long-term treatment performance.

- **When regulatory discharges to the estuaries are unavoidable, declare a State of Emergency**

  Discharges to the estuaries during the 2013 wet season were conducted within the existing authorities and guidance for Lake Okeechobee operations. In addition, the wet conditions experienced in 2013 were within the boundaries used to develop the LORS 2008 schedule and impacts to the estuaries were included in the National Environmental Policy Act (NEPA) analysis.

  The environmental impacts observed last summer reflect an inherent problem with the C&SF Project system and its operational limitations. Completing all of the CERP projects is a major part of the solution. Declaring a State of Emergency in order to force water south does not alleviate the requirements for the protection of life and property or allow violations of water quality standards or the District's NPDES and EFA discharge permits.

- **Notify the FDEP and County Health Departments when blue-green algae are present in the C-43 and C-44 canals.**

  The District works closely with the Florida Department of Environmental Protection and the Florida Department of Health to ensure timely reporting and notification of the presence of blue-green algae in waterways that we manage.

  When evidence is found of algal blooms, District staff post information in the Harmful Algae Bloom Tracking Module website maintained by the Department of Health. As this information is posted, an automatic notice is sent to impacted areas. The algae bloom of May 8, 2013, was posted to this site, and automated notices were generated for affected counties, including Martin and St. Lucie counties.

- **Send Lake Okeechobee Regulatory Discharges to STA-5/6**

As part of the effort to move more water south from Lake Okeechobee and improve water distribution to the STAs, the District is evaluating ways to deliver water from the lake to the STA-5/6 complex.

The infrastructure associated with the STA-5/6 complex and its location with respect to the EAA canal system do not currently make it possible to direct water from the lake to the treatment wetland's inflow facilities. During the 2005 EAA Regional Feasibility Study, one alternative evaluated the feasibility of adding infrastructure to provide a connection from the Miami Canal to the STA-5/6 inflow facilities. At that time, this alternative was not recommended for further consideration because of the historically poor performance of STA-5.

Since then, STA-5 performance has significantly improved and additional treatment facilities have been completed in the STA-5/6 complex. As a result, the District is now revisiting the feasibility of creating a connection from the Miami Canal to the STA-5/6 inflow facilities.

- **Provide weekly charts documenting Lake Regulatory Discharges and nutrient loads to the estuaries, and EAA runoff south to the STAs, WCAs, and other public lands. Also provide access to "provisional" water quality data**

  The District provides extensive, publicly accessible information through our website, www.sfwmd.gov, including real-time water levels, the status of water control structures and meteorlogic, hydrogeology and water quality data.

  In coordination with local governments, the District collects and analyzes water quality samples from a network of stations in the coastal estuaries. After analysis is completed, this information is also made available to the public through our DBHYDRO database, which can be accessed at:

  http://www.sfwmd.gov/portal/page/portal/xweb%20environmental%20monitoring/dbhydro%20application.

  In addition, the information is summarized annually in the South Florida Environmental Report.

  Real-time hydrologic data is also available on the District website at:

  http://www.sfwmd.gov/portal/page/portal/levelthree/Live%20Data.

  A weekly summary of provisional STA water quality data is available to interested parties via email.

- **Request FDEP provide an update on permit issued to the USACE for discharges from the Lake to the estuaries**

  The USACE does not hold state permits associated with discharges from Lake Okeechobee. However, the USACE worked closely with the District, DEP and other agencies in the development of LORS 2008, and it continues to work with these agencies to implement the regulation schedule.

- **Prepare a report on the environmental impacts of Lake Okeechobee Regulatory Discharges on Threatened and Endangered Species**

  The USFWS and the FWC are the responsible agencies for monitoring impacts to threatened and endangered species. Information regarding the status of these species in the St. Lucie Estuary and Indian River Lagoon is pertinent to understanding the impacts of lake releases and can be obtained from these agencies. Information specific to LORS 2008 is also contained in the NEPA documentation and USFWS Biological Opinion.

- **Provide an update on when Lake Okeechobee will meet the TMDL**

  The Florida Department of Environmental Protection began developing its Lake Okeechobee Watershed Basin Management Action Plan (BMAP) in early 2013. This BMAP is an important effort that will become the overarching water quality restoration plan for the lake. It will identify projects and activities in the watershed and provide an enforceable schedule for actions necessary to achieve the Total Maximum Daily Load (TMDL) for phosphorus. Tracking progress toward achieving the TMDL will also be done through the BMAP.

  There are several challenges to meeting the TMDL, including legacy phosphorus in the lake, high levels of watershed phosphorus loading, lack of stormwater storage in the watershed and internal lake loading. The coordinating agencies are committed to achieving the TMDL and will continue to identify projects and funding opportunities aimed at this goal.

- **Add projects in the Estuary Watershed Protection Plans to reduce nutrients from Lake Okeechobee discharges**

  The District is actively working with DEP to identify and implement nutrient reduction projects through the St. Lucie and Lake Okeechobee BMAPs. These projects will also be reflected in the Estuary Watershed Protection Plans.

- **Work with the USACE to expedite the repair and operation of the 10 Mile Creek Reservoir and STA**

  Completion of the 10 Mile Creek Reservoir and STA is another important step to provide additional water storage in the St. Lucie basin for local peak stormwater flows. The USACE, which constructed the facility, is currently working to identify options for its repair and operation. The District is participating in those discussions and has presented options that may provide the USACE with a path forward in making the 10 Mile Creek facility a functioning and viable component of the water management system.

Summary of the technical discussion that took place at the April 16th meeting with SFWMD scientists:

District staff appreciated having the opportunity to meet with you to go over many of the items discussed above. In addition you provided additional suggestions and questions which are summarized in this section. If an item has already been addressed in the section above it is not repeated in this section.

Your summary of 18 acknowledged constraints was well received and are included here:

1. Hydraulic conveyance limitations restrict Lake releases into and through the EAA canals to the STAs/WMAs and WCAs.
2. Need to maintain authorized level of flood protection.
3. USACE and SFWMD to implement improved operations communication protocols, e.g., closing LC10-A during storms.
4. Available capacity in the WCAs

5. The STAs are not achieving the WQBEL for TP concentrations entering the Everglades Protection Area.
6. STA critical maintenance
7. Building in flexibility to return cells to full operation when other activities require cells to be taken off-line
8. Birds nesting in STAs
9. Potential challenges to obtaining Migratory Bird Treaty Act Special Purpose Permits
10. ** Synchronized operations required to deliver Lake releases to STA-5/6 and Rotenberger WMA
11. Fear of cattail expansion in the WMAs with inflow waters above 50 ppb.
12. Opposition from hunters that have grown used to the dry conditions of the Holey Land WMA since flow-through operations ceased in 2005
13. Time and interagency cooperation is required to identify constraints and revise existing policies.
14. Would require development of Lake O release guidance for the middle and upper bands of the 2008 LORS; Process needed for release guidance development
15. Potential challenges by federal agencies and third parties.
16. Sediment estimates may require additional sampling.
17. Resources required to revise LORS are limited
18. Resources - funding, land, etc.; minimal disruption to existing communities

To this list, there are additional challenges and constraints:

- Uncertainty associated with forecasting weather events that may require lake releases to be halted until the rainfall has passed.
- Structural limitations vary due to changes in the lake level and canal levels which may prevent achieving the maximum design discharge (maximum allowable gate opening curves, gates off-line due to maintenance, etc.)
- STA vegetation damage, reduced treatment performance and potential violation of the federal Consent Decree;
- Authorized operating rules and regulations.

** For Item 10 above, see the responses elsewhere in this letter regarding STA 5 / 6 and Rotenberger

You provided the following as some basic questions. Responses are provided below your question unless answered elsewhere in this letter:

- **When LORS2008 guidance is to send maximum practicable to WCAs, why isn't Lake water used:**
  - **to prevent STA-5/6 performance deterioration due to dryout?**
  - **to maintain minimum of 6 inches in all STA treatment cells?**
  - **to prevent ecological degradation of Holey Land?**
  - **to achieve optimal Lake Okeechobee recession of 0.5 feet per month?**

  The District has, and will, continue Lake regulatory releases to the WCAs via the STAs as long as the LORS 2008 schedule recommends. Since May 2013, which is the beginning of the current water year, the District has released over 175,000 acre-feet of lake water to the STAs with over half releases between, November 1, 2013 and April 23, 2014. The average annual volume of lake releases assumed under current modeling scenarios is approximately 60,000 acre-feet. It is anticipated that by the end of this water year we will have treated roughly three times the assumed annual average. We are treating lake releases on a week to week basis while attempting to avoid damage to the STA vegetation which would diminish performance during the upcoming wet season.

  The continued suggestion to send Lake water to STA-5/6 to prevent performance deterioration due to dryout is a good suggestion and as responded to above, the system as currently designed does not have a direct connection from Lake Okeechobee to STA-5/6 without the risk of triggering permit diversion by opening G-373 and the mixing of treated and untreated water that may end up being discharged through S-8 and G404. As was discussed in the meeting it will be looked at as part of the infrastructure in Restoration Strategies.

  This dry season, in the STAs that can receive Lake Okeechobee water (all but STA-5/6), cells have not been below 6 inches deep due to dry out. Stages have been lowered in specific cases due to construction and rehabilitation activities that require lower depths.

  It has been suggested that the District send untreated basin and lake releases to the Holey Land WMA. The option to send up to 250 cfs of untreated water is not a decision that is solely at the discretion of the District. Staff are actively coordinating with both Florida Department of Environmental Protection and FWC regarding opportunities to send additional water to Holey Land and Rotenberger.

  The 0.5 feet per month recession rate during the dry season for Lake Okeechobee is a general guideline, not a requirement. The rate of recession also varies through the dry season. Early in the dry season there is often a slower rate of recession, which increases later in the dry season as ET picks up. Assessment of the in-Lake condition is what is used to determine whether the recession rate is too slow or too fast. Avoidance of reversals, especially as wading bird foraging and nesting increases, is also considered. Our Lake Okeechobee ecologists consider the current recession rate to be good considering the current stage of the Lake.

- **What is justification for elevating STAs to level of protection afforded the Everglades Protection Area when interpreting LORS guidance?**

  The STAs have not been elevated to be afforded the same protection as the Everglades Protection Area (EPA). The STAs are required under state law and permits to protect the EPA by reducing phosphorus concentrations in stormwater and lake releases before entering the EPA. The District, therefore, manages lake releases to maintain phosphorus removal performance and to avoid damaging the STAs and the downstream EPA.

- **What is the science behind the extensive vegetation management activities that restrict flow in thousands of acres of treatment cells?**

  Research conducted in the STAs and in other wetlands systems (Grace 1989; Chen et al. 2010; Miao and Zou 2012, Chen and Vaughan, 2013) combined with our operational experience in managing the STAs (SFER 2013, 2014) indicates a decline in cattail photosynthesis, shoot growth, and cattail shoot density when long-term mean daily water depths increase above 30 cm. The District has documented thinning and loss of emergent vegetation and the development of short circuits in STA emergent cells due to prolonged wet season depths and flows. These changes occur primarily in the upstream portions of the emergent vegetation cells but can eventually diminish overall performance if allowed to penetrate deeply into emergent cells. To counteract the loss and thinning of emergent vegetation that occurs during the wet season, the District works to re-establish emergent vegetation in these areas during the dry season. This can be accomplished through controlled drawdowns, to encourage seed germination and increased shoot densities, along with hand planting of alternative species of emergent vegetation such as bulrush in deeper areas. We have converted thousands of acres of emergent vegetation into Submerged Aquatic Vegetation (SAV) at the downstream portions of the STAs. We have found that SAV have the capacity to lower outflow concentrations but they are not completely infallible, due in part to wind damage from hurricanes and herbivory by coots, ducks and exotic apple snails. We have also documented numerous unexplained declines in stands of some species (primarily hydrilla, and to a lesser extent, muskgrass (DeBusk at al. SFER 2014). In recent years, for example, the SAV cells in STA-3/4 have experienced near total loss of submerged aquatic vegetation during the winter months for unknown reasons. To re-establish submerged species, the District holds water levels at lower than target depths to encourage recovery of submerged species along with inoculating the cells with SAV removed from other cells. Because the past two wet seasons were relatively wet and included extreme events, there has been the need for more vegetation management activities to be underway this dry season than in prior recent years.

With majority of risk reduction goals satisfied (Corps 2012) why doesn't District push for revisions of LORS2008 to increase upper limit of regulation schedule?

- **More water available for water supply**
- **Less destructive releases to estuaries**

While, only the Corps, through their Herbert Hoover Dike Dam Safety Modification Study (HHD DSMS) can determine whether the risk reduction goals for the Herbert Hoover Dike have been satisfied, in February 2014, the District's Governing Board directed staff to analyze the potential benefits of additional strategies for guiding flexibility within the Lake Okeechobee regulation schedule (2008 LORS), particularly when the lake level is within the middle and upper operational bands. Discussion of a process for this analysis and for stakeholder involvement is scheduled for the June 5th meeting of the WRAC. The primary goal will be to design and analyze various operating guidelines that might improve the performance of the multiple management objectives for the lake—without reducing flood control performance.

In the meeting you mentioned that there have been missed opportunities during Dry season 2013-2014 to send water south due to the:

- **Minimal risk of water supply shortage;**
- **desired Lake recession not met;**
- **Holey Land desperately needed water; STAs drying out – ground nesting birds coming in, WCA-3A drying out;**
- **available capacity in WCAs; modeling predicting >60% risk of releases to estuaries in May**

Risk to water supply has not been a factor in determining the volume of regulatory releases moved south out of Lake Okeechobee. LORS 2008 operating bands provide the guidance on regulatory releases.

The 0.5 feet per month recession rate during the dry season for Lake Okeechobee is a general guideline, not a requirement. See additional information above.

Areas such as the Holey Land; STA-5/6, and WCA-3A are experiencing drying trends and we share your frustration that the system of canals and water control structures does not currently provide a means for delivering water in the required timing, location or of the quality to prevent dry out.

The District Position Analysis (PA) modeling does indicate >60% risk of releases to estuaries in May. That is slide 13 "Lake Okeechobee – LORS2008 Releases to the Estuaries - Unconditional PA Operations" located at:

http://www.sfwmd.gov/portal/pls/portal/docs/17446982.PDF

Here are some technical points based on a review of the PA data:

1) The increased probability of releases as the simulation proceeds through April is a result of Adaptive Protocol implementation, specifically the 5 psu criteria associated with the baseflow decision path. The chance of exceeding 5 psu has high correlation to the probabilities observed in the estuary release probability graphics.

2) The vast majority of the Lake regulatory releases simulated in the April PA are discharged to the Caloosahatchee at low rates of about 650 cfs rather than the St Lucie. The graphic you cited displays the probability of regulatory releases and does not discern between high volume releases and low volume releases. Other products are available at the aforementioned web site.

- **Implement additional measures to reduce inflows to the Lake**

The SFWMD recognizes the existing water management system does not have sufficient storage and treatment facilities to reduce the damaging discharges to the northern estuaries. Additional storage projects have been a focus of several planning efforts since long before the USACE published the reconnaissance report for the C&SF Project Restudy in 1994.

As you know the 2013 wet season started with record high rainfall from April-July which led to about eight feet of inflow to Lake Okeechobee. During the 2014 March WRAC meeting the SFWMD provided several hindsight what-if analyses, one of which demonstrated that holding an additional 97,000 acre-feet of water in Lake Kissimmee, Cypress and Hatchineha during the 2013 wet season would have increased flooding risk to private property with little to no benefits to the northern estuaries.

Because the 2013 wet season inflows to Lake Okeechobee were in excess of 3 million acre-feet, even a considerable storage of 97,000 acre-feet would not have meaningfully affected Lake Okeechobee stages and associated release decisions. Analysis also demonstrated that the significant inflows from basins tributary to the St. Lucie Estuary alone resulted in reduced salinities, oyster mortality, and die-off of grasses that are sensitive to estuary salinity. Lake Okeechobee releases surely contributed to that problem, but were not the only reason for the estuary problem.

These analyses of 2013 wet season what-if scenarios prepared for the March 2014 WRAC meeting are available at:
http://www.sfwmd.gov/paa_dad/docs/F1714878864/03_2013WetSeasonPresentation_WRAC_Strowd_03062014.pdf

Author	Comment
sfwmd SFWMD Administrator Registered: 05/14/10 Posts: 187	Posted 08/18 #1 Chapter 2: South Florida Hydrology and Water Management Edit | Delete
ggoforth Registered: 10/01 Posts: 8	Posted 10/22 #2 **Comments on Draft 2015 SFER - Ch 2.docx** 580.19 KB 20 downloads Edit | Delete
RiversCoalition Registered: 10/23 Posts: 1	Posted 10/23 #3 The Rivers Coalition, representing over 70 organizations, endorses Gary Goforth's comments regarding the South Florida Water Management District's Annual Report. The River's Coalition calls for the SFWMD to address the obvious shortcomings and their failure to adequately report the adverse impacts of the Lake Okeechobee releases in their Annual Report. Edit | Delete
sollis **Moderator** Registered: 05/20/10 Posts: 89	Posted 6 minutes ago #4 Please see attached agency responses to public comments, posted by G. Goforth on 10/22/14. S. Ollis (SFWMD), 11/24/2014. **Attached Files** App._1-3_RTCs_public_111214.pdf (3.31 MB, 0 views) Edit | Delete

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RESPONSES TO PUBLIC COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 2

Wossenu Abtew

Public Comments From*:* Dr. Gary Goforth, posted on the SFER WebBoard, 10/23/2014

Comment 1: The chapter omitted discussion of the most environmentally destructive water management operations conducted jointly by the SFWMD and USACE in more than a decade - the operations that took place between May 2013 and October 2013 associated with the destructive Lake Okeechobee regulatory releases to the estuaries. During WY2014, more than 1,600,000 acre feet of Lake Okeechobee regulatory releases were discharged to the St. Lucie River and Estuary, the Caloosahatchee River and Estuary and the Lake Worth Lagoon, yet the chapter omits discussion of these (Figures 1 and 2 below).

> *a. More than 418,000 acre feet of Lake Okeechobee regulatory releases were discharged to the St. Lucie River and Estuary; more than 1,150,000 acre feet of Lake Okeechobee regulatory releases were discharged to the Caloosahatchee River and Estuary. More than 100,000 acre feet of Lake Okeechobee regulatory releases were discharged to the Lake Worth Lagoon. While the estuaries were being devastated by these harmful Lake releases, less than 170,000 acre feet of Lake Okeechobee regulatory releases were discharged to the Everglades – the pre-development destination for excess Lake water.*

Response: The flows from Lake Okeechobee into canals leading to the estuaries are presented in **Figure 2-1**, **Table 2-1** (shown below in red), and **Table 2-10**. For the final report, **Table 2-1** will be expanded to show calculated lake and runoff portions of inflows into the two estuaries. Also, in the final report the respective text under the *Upper East Coast and the St. Lucie Canal and Estuary* and *Lower West Coast* sections will be expanded to show the amount of lake water sent to the estuaries.

Lake Okeechobee releases to the STAs are reported in Appendix 3A-5 of this volume (see **Table 6**; 175,200 ac-ft). The question on Lake Okeechobee releases was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

Table 2-1. Summary of flows for WY2014, the percent of historical average they represent, and their comparison to WY2013. [Note: Structures used to calculate inflows and outflows into the major hydrological units are presented in Appendix 2-5 of this volume.]

Location	WY2014 total flow (ac-ft)	Percent of historical average	WY2013 total flow (ac-ft)
Northern Everglades			
Lake Kissimmee Outflows	765,563	108	439,653
Lake Istokpoga Outflows	319,317	147	280,544
Lake Okeechobee Inflows	2,695,257	130	2,100,036
Lake Okeechobee Outflows	2,527,633	177	1,041,902
Flows into St. Lucie Canal from Lake Okeechobee	444,651	173	103,622
Flows into St. Lucie Estuary through St. Lucie Canal	675,722	220	152,722
* Lake Okeechobee Releases to St. Lucie Estuary	418,559+		
* C-44 basin runoff into St. Lucie Estuary	257,154+		
Flows into Caloosahatchee Canal from Lake Okeechobee	1,225,613	232	501,374
Flows into Caloosahatchee Estuary through Caloosahatchee Canal	2,521,600	204	1,137,904
* Lake Okeechobee Releases to Caloosahatchee Estuary	1,146,488+		
* Basin runoff into Caloosahatchee Estuary	1,377,052+		
Southern Everglades			
Water Conservation Area 1 Inflows	380,269	80	363,897
Water Conservation Area 1 Outflows	471,206	107	483,713
Water Conservation Area 2 Inflows	1,078,408	168	1,074,320
Water Conservation Area 2 Outflows	965,358	150	938,199
Water Conservation Area 3 Inflows	1,248,362	106	1,322,042
Water Conservation Area 3 Outflows	1,452,583	144	1,225,088
Everglades National Park Inflows	1,590,971	161	1,496,719

* calculated estimates

+ derived from Chapter 10 of this volume.

b. These releases were the subject of numerous WRAC and other public meetings, generated multiple citizen protests during which thousands of citizens expressed their outrage, resulted in the formation of a State Legislative Committee which held multiple public hearings, and was the focus of a federal Congressional hearing.

Response: This question was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth). The IRLLOB committee is further discussed in the *Strategies Moving Forward* section of Chapter 10 of this volume.

c. *Suggest that the chapter summarize the water management operations during WY2014 leading up to the regulatory releases, document the volumes of water discharged to the estuaries, and identify short-term steps the agency is conducting to reduce these devastating impacts in the future.*

Response: The releases to the estuaries from Lake Okeechobee are summarized in the chapter (**Table 2-1**). This question was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth). Please refer to Chapter 10 of this volume on estuary nutrient load, freshwater inflows, salinity and the NEEPP coordinating agencies strategies for moving forward.

d. The District should prepare an After Action report documenting the flows, nutrient loads and sediment loads associated with the Lake regulatory releases. The partial report prepared by the District in October 2013 was incomplete and contained numerous errors and omissions (see my WRAC presentation slides 42-45 for specifics).

Response: This question was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

Comment 2: As contained in the 2012 EFA Watershed permit for the STAs, Ch. 373.4592 directs the SFWMD to send 28 percent more water to the Everglades than occurred during the 1979-1988 period, including an average annual volume of Lake regulatory releases of 250,000 acre feet. As shown in Figure 3 below, the actual Lake flows to the Everglades have decreased. Suggest that the chapter document assessment of water management operations compared to this Legislative direction, and identify all the operational, policy, legal restrictions to moving additional Lake flow to the Everglades.

Response: This question was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

Comment 3: Table 2-2. Suggest that the chapter explain the inordinately high pumping volumes in WY2014, which does not intuitively synch with prior discussion that WY2014 had about average rainfall.

Response: Please note that the pumping report is for the Fiscal Year (October 2012 to September 2013). Data analysis presented in another report was used rather than generating new sets of water year pumping data. Runoff amount is dependent on antecedent condition, rainfall amount, and rainfall distribution. Most of the pumping (2,960,944 ac-ft) was from May to September 2013 (67 percent). May 2013 was wetter than average; July, August, and September are in the wet season. October and December 2012 were wet months with 18 percent of the pumping (783,835 ac-ft). Most pumping was to the south and the increase in pumping corresponds to the increase in water sent to the south compared to historical average, Water Conservation Area 2A inflows (168 percent); Water Conservation Area 3A inflows (106 percent), and Everglades National Park

inflows (161 percent), as shown in **Table 2-1**. With the expansion of STA-2 and STA 5/6, the number of pumps has increased. Also, the same water is pumped twice as inflow and outflow to an STA.

Comment 4: Line 691 – Suggest that the chapter detail the Lake regulatory releases

a. *Suggest that the chapter discuss the influence of LORS2008 on WY2014 operations*
    i. *Temporary schedule set in place due to concern of HHD safety*
    ii. *Lowered top end of schedule by 1.25 ft*

Response: This question was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

b. *Suggest that the chapter discuss the reasons why the SFWMD did not follow LORS2008 guidance to send maximum amount practicable to WCAs.*

Response: This question was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

c. *Line 708 – Suggest that the chapter explain why Lake outflow was 170% of average while inflows were only 130% of average.*

Response: Lake Okeechobee inflows and outflows reflect hydrologic conditions and water management decisions. This question was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

d. *Suggest that the chapter document the volume of Lake releases sent for water supply to the EAA, L-8 basin, Caloosahatchee River basins, C-51 Basin, STAs, Lower East Coast, etc. and compare this to the volume of Lake water sent to*
    i. *the Everglades for water supply*
    ii. *the estuaries through regulatory releases.*

Response: This question was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

Comment 5: Line 737 – Missing details of devastating Lake releases to St. Lucie River and Estuary.

Response: Lake releases to estuaries are shown in **Table 2-1** above. For the final report, text will be added reflecting lake releases and runoff fractions of inflows into the estuaries. The impacts of high freshwater inputs and nutrient loading from the lake and the watershed on water quality and aquatic habitat (seagrass and oysters) to the systems are reported for the Caloosahatchee and St. Lucie estuaries in the *Hydrology*, *Water Quality*, and *Aquatic Habitat* sections, respectively, of Chapter 10 of this volume.

Comment 6: Line 742 – Suggest that the chapter mention that C-44 Basin runoff often is also routinely sent to Lake Okeechobee when the lake stage is 14.5 or lower.

Response: The following sentence has been added in the same paragraph "When the lake stage is below 14.5 ft NGVD and the S308 structure is open, runoff from the C-44 (St. Lucie Canal) basin flows back to the lake with the C-44 stage relatively higher". The amount of water that backflow to the lake is shown in Appendix 2-5, Table 2, and in previous reports.

Comment 7: Line 748 – What is meant by: "Rainfall in Martin/St. Lucie rainfall area has improved from WY2013 by 5 inches."? Should "improved" be "increased"?

Response: Change will be made in the final version as suggested.

Comment 8: Line 755 - Missing details of the devastating Lake regulatory releases to the Caloosahatchee River and Estuary.

Response: This question was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth). The impacts of high freshwater inputs and nutrient loading from the lake and the watershed on water quality and aquatic habitat (seagrass and oysters) to the systems are reported for the Caloosahatchee and St. Lucie Estuaries in the Hydrology, Water Quality and Aquatic Habitat sections of Chapter 10 of this volume.

Comment 9: Line 778 – Suggest that the chapter document the approximately 170,000 acre feet of Lake regulatory releases to the STAs and Wildlife Management Areas.

Response: Please see response to comment 1a.

Comment 10: Line 797 - Suggest that the chapter document the quantity of Lake regulatory releases to the WCAs. Evaluation of the WCA stages suggests that additional Lake water could have been sent to the WCAs, particularly WCA-1 and WCA-3A prior to the devastating Lake releases to the estuaries (Figure 4 below). Suggest the chapter discuss/show the available capacity that was in the WCAs leading up to, during and after the May-October releases to the estuaries, and discuss why more releases weren't made to the WCAs when LORS2008 guidance suggested that course of action.

Response: This question was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

RESPONSES TO PUBLIC COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 3A

Paul Julian II[1]

Public Comments From*:* Dr. Gary Goforth, posted on the SFER WebBoard, 10/22/2014

Comment: Suggest that the chapter document and discuss the fact that despite sending approximately 170,000 acre feet of Lake releases to the Everglades carrying approximately 5 metric tons of TP, the impact on water quality in the EPA was insignificant.

Response: Noted, text will be revised to highlight the volume of water entering the Everglades and the resulting water quality. Thank You.

[1] Florida Department of Environmental Protection, Office of Ecosystems Projects, Fort Myers, FL

RESPONSES TO PUBLIC COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, APPENDIX 4-2

Randall McCafferty, Jonathan Madden and Pamela Wade

Public Comments From: Dr. Gary Goforth, posted on the SFER WebBoard, 10/22/2014

Comment #1:

*Included in the calculations summarized in Table 2 was a TP value of **2,500 ppb** reported for the S-351 autosampler on 4/8/2014 (collection dates of 4/1 – 4/8).*

- *This was the highest TP value at this location reported in the 41-yr period of record (beginning April 9, 1973)*
    - *This value is 25 times higher than the mean value for the 41-yr record for this station (92 ppb), equal to 25 times the standard deviation; often a value 3 times the standard deviation higher than the mean is classified as an outlier*
    - *This value is 25 times higher than the median value for the 41-yr record for this station (80 ppb)*
    - *This value is classified as a statistical outlier using the Maximum Normed Residual test (Snedecor and Cochran 1989), and every other outlier test I applied.*
    - *The prior autosampler value was 89 ppb (1/28th of the 2,500 value)*
    - *The following autosampler value was 185 ppb (1/13th of the 2,500 value)*
    - *The grab samples for the same period were 72 ppb and 143 ppb*
    - *The 7-day autosample value for G-434 (inflow to STA-2 on the NNR Canal downstream of S-351), which received Lake inflow during that 7-day period, was 28 ppb*
- *The use of this value resulted in a **7-day** estimate of TP load of 19,756 kg*
    - *which is more than the cumulative load for the entire 358 remaining days of WY2014*
    - *which is more than the cumulative load for the entire WY2012*
    - *which is more than the cumulative load for the entire WY2013*
- *The use of this value resulted in an estimate of the annual flow-weighted mean TP concentration of 170 ppb*
    - *Which is almost 50 percent higher than the WY2014 annual near-shore TP concentration reported in Table 8-10 of the draft SFER (115 ppb)*
    - *Which is almost 50 percent higher than the WY2014 annual Lake Okeechobee TP concentration reported on page 8-36 of the draft SFER (118 ppb)*
    - *Which is more than the WY2014 FWM concentration at S-352 – a phenomenon which has never occurred in the last 20 years*
    - *Which is almost twice the WY2014 FWM estimated by using the 143 ppb grab sample collected on the same day (87 ppb)*

Due to the preponderance of evidence that this value is an outlier, suggest it be excluded from WY2014 calculations.

Response #1: The District acknowledges the TP concentration result of 2,500 ppb from the automatic sampler composite collected April 8, 2014, at the S-351 site is a high statistical outlier. District standard quality assurance procedures were followed for collection and analysis of the water quality samples. Based upon a review of District records, there is no evidence indicating the sample result collected is not representative of the discharge water quality for the period from April 1 to April 8, 2014. As such, the value remains to be included in the calculation of lake inflow load to the EAA which contributes to the flow through and runoff load reported for WY2014. Regardless, the difference of including or excluding this single concentration would not significantly affect the calculated results reported. The District is pursuing the addition of qualifier codes for this sample result in the DBHYDRO database's REMARK_CODE field to indicate a historical outlier and denote that an investigation was performed and nothing unusual was found to justify flagging or removing the data point. Therefore, those performing data analyses in the future could decide whether inclusion of this data is appropriate for their specific purpose.

RESPONSES TO PUBLIC COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 5B

Delia Ivanoff, Tracey Piccone,
Michael Chimney and Larry Gerry

Public Comments From: Dr. Gary Goforth, posted on the SFER WebBoard, 10/22/2014

Comment #1: The chapter is well-written and contributes another year's performance information regarding the most effective treatment wetlands on the planet! However, the chapter omitted discussion of the benefits and impacts of Lake regulatory releases on the STA performance (see below).

Response #1: Because lake regulatory releases comprised a relatively small portion of the total annual volume of water treated by the STAs and, because a variety of other factors (such as phosphorus loading rates, inflow concentrations, timing of rainfall events, extreme runoff events, vegetation health, loss of SAV communities, flux, etc.) also affect annual performance, it is not possible to isolate and quantify the positive or negative effect of lake regulatory releases on STA performance. The District continues to monitor STA inflow and outflow water quality and STA vegetation for signs of stress due to prolonged deep water conditions. Based on our experience, we have observed significant stress and loss of emergent vegetation in areas with extended periods of deep water and improved cattail growth and plant density in areas where water depths average 1.25 ft or less. As a result of large lake releases, we anticipate the need for increased vegetation enhancement activities during each dry season to offset the thinning and loss of emergent vegetation and to halt the development of short circuits that commonly occur in the STAs. These enhancement activities require that flow-way operations be restricted for a period of time for planting emergent vegetation, or that flow-way operations be terminated for drawdown, cattail germination and grow-in of seedlings.

Comment #2: The STA management and operations staff should be commended for diligently investigating ways to send additional Lake regulatory releases to the Everglades in order to reduce the devastating releases to the estuaries. For example, through the 2013-2014 dry season, approximately 20 percent more Lake water was sent to the Everglades than during the prior dry season.

Response #2: Comment acknowledged.

Comment #3: A critical omission from the chapter is documentation and discussion of the influence of approximately 170,000 acre feet of Lake Okeechobee regulatory releases on the performance of the STAs. See the STA chapters in previous SFERs for precedence (e.g., Goforth et al. 2004, Goforth et al. 2005, and Germain et al. 2012).

a. *An important finding from the WY2014 operations is that although the volumes of Lake water treated were the 2nd highest in 20 years (and the highest since WY2003), the impacts to STA performance were not significant (the chapter documents that WY2014 was one of the best performance years to date). This finding should go a long way to dispelling the fear that treating Lake releases at relatively low hydraulic loading rates of 0.5-1.5 cm/day will cause an adverse impact to STA performance, particularly when spread out over the entire year as called for in LORS2008. Outflow TP concentrations from Lake Okeechobee have decreased significantly since the 2004-2005 hurricanes, when Lake loading on STA performance was last investigated.*

Response #3a: See Response #1.

b. *Suggest that the chapter document the flows and TP loads associated with Lake releases to each individual STA. In addition to total flows and loads, suggest expressing the Lake releases in terms of hydraulic loading rate (cm/day) and nutrient loading rate (g/m2/yr). For reference, the chapter should compare WY2014 Lake releases to the WY2003 Lake release that overloaded STA-1W (approximately 6 ft per month).*

Response #3b: Volumes of lake releases delivered to each STA in WY2014 will be added to the final version of the chapter.

c. *Suggest that the chapter document why certain STA treatment cells were off-line during the devastating May – October 2013 Lake releases to the estuaries. For example, which cells had operations impeded by nesting birds, USACE construction, "resting" of treatment vegetation, vegetation management activities, etc. Suggest that the chapter provide a rationale why these cells were not receiving the full hydraulic loading they were designed for before and during the emergency operations necessitating Lake releases to the estuaries.*

Response #3c: The introductory paragraphs in the *Facility Status and Operational Issues* section and the *Migratory Bird and Snail Kite Nesting* subsection of each STA summary in the chapter together with Appendix 5B-2 document when, and in which STA cells, birds nested during WY2014 and the operational adjustments made to protect these nests. The authors will add notes about bird nesting where appropriate to Table 5B-2 in the final version of the chapter. The last sentence in this comment was responded to previously (See attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

Comment #4: As contained in the 2012 EFA Watershed permit for the STAs, Ch. 373.4592 directs the SFWMD to send 28 percent more water to the Everglades through the STAs than occurred during the 1979-1988 period, including an average annual volume of Lake regulatory releases of 250,000 acre feet. Suggest that the chapter document the reasons why this legislative mandate has not been met despite an additional 18,000 acres of treatment area and relatively low outflow concentrations from Lake Okeechobee. Suggest that the discussion address the fact that the 2012 STA permits do not require compliance with the WQBEL for another 10 years.

Response #4: The comment was responded to previously (See attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

Comment #5: At one time, all of the STA Operational Plans contained guidance to maintain a minimum depth of 6 inches to avoid dryout. Suggest that the chapter document the operations that achieved (or didn't achieve) this operational guidance, and document the number of cells and treatment area that were affected by dryout.

Response #5: Due to regional conditions, only four cells dried out in STA-5/6 (Cells 6-2, 6-3, 6-4 and 6-5) during WY2014 as documented on page 5B-38. While small pumps are used to hydrate the SAV cells in STA-5/6, the District currently lacks the infrastructure needed to convey lake releases to the inflow structures of STA-5/6 to minimize dryout of the emergent cells. The Eastern Flow-way of STA-1E was kept dry throughout WY2014 due to construction activities associated with the removal of the PSTA Demonstration Project in Cell 2.

Comment #6: Line 11 – Summary: suggest that the section summarize the Lake regulatory releases to the STAs.

Response #6: A bullet will be added to the Summary in the final version of the chapter stating that during WY2014, approximately 175,000 acre-feet of lake regulatory releases were treated in the STAs for delivery south to the Everglades Protection Area.

Comment #7: Line 290 – The initial water management operation contained in the Avian Protection Plan is to maintain a minimum depth of 6 inches to discourage nesting. Suggest that the chapter document the operations that achieved (or didn't achieve) this operational guidance, and document the number of cells and treatment area that had operations impeded due to nesting birds. When will the District obtain the necessary special purpose permits to avoid operational impedance in the future?

Response #7: See the *Migratory Bird and Snail Kite Nesting* subsection of each STA summary and Appendix 5B-2 of this volume for information regarding the number of nests and the operational adjustments made to protect these nests. The District was able to keep the STA fully hydrated prior to the beginning of the nesting season (see Table 1 in Appendix 5B-2), which greatly reduced the number of black-necked silts nests in WY2014 compared to previous years. The last sentence in this comment was responded to previously (See attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

Comment #8: Line 355: Lake regulatory releases were also sent to STA-1E in May and October 2013 and January-April 2014. Based on the STA performance over the last two years, it appears that STA performance improved as a result of the Lake releases; suggest that this be documented and discussed.

Response #8: See response #1. We will recheck the timing of lake regulatory releases to STA-1E. The annual flow-weighted mean (FWM) outflow TP concentrations from STA-1E in WY2013 and WY2014 actually were higher than outflow concentrations in the two previous water years and comparable to outflow concentrations in other water years (see Figure 5B-5). At this time, we would not conclude that lake releases improved STA performance as lower outflow TP concentrations in years prior to WY2013 and WY2014 were achieved in the absence of lake releases. On a positive note, the treatment of the lake releases did not have a discernable negative impact on STA-1E treatment performance in WY14. The District will continue to monitor for potential long-term impacts to performance.

Comment #9: Line 483: Lake regulatory releases were also sent to STA-1W in April 2014. Based on the STA performance over the last two years, it appears that STA performance improved as a result of the Lake releases; suggest that this be documented and discussed.

Response #9: See response #1. We will recheck the timing of lake regulatory releases to STA-1W. Upon inspection of the data in Figure 5B-8, we have the same response to this comment as for Comment #8.

Comment #10: Line 600: Lake releases to STA-2 began in October 2013, not November 2013. What, if any, impact on STA performance can be attributed to Lake regulatory releases? Based on the STA performance over the last two years, it appears that STA performance improved as a result of the Lake releases; suggest that this be documented and discussed.

Response #10: We will recheck the timing of lake regulatory releases to STA-2. Upon inspection of the data in Figure 5B-11, we have the same response to this comment as for Comment #8.

Comment #11: Line 722: Lake releases to STA-3/4 began in May, and continued during August and October. Based on the STA performance over the last two years, it appears that STA performance improved as a result of the Lake releases; suggest that this be documented and discussed.

Response #11: See response #1. We will recheck the timing of lake regulatory releases to STA-3/4. The FWM outflow TP concentrations from STA-3/4 in WY2013 and WY2014 were several ppb lower than in the two previous water years (see Figure 5B-14). Lake regulatory releases may have played some role in the improved treatment performance. Then again, the timing of the lake releases and the improved treatment performance could be a coincidence and the improved treatment performance actually resulted from changes in other environmental factors. Note that STA-3/4 has exhibited treatment performance over its period of record that was comparable to performance observed in WY2013 and WY2014, and that the phosphorus removal in past years presumably was achieved in the absence of lake releases.

RESPONSES TO PUBLIC COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 8

Lesley Bertolotti, Bruce Sharfstein and Joyce Zhang

Public Comments From: Dr. Gary Goforth, posted on the SFER WebBoard, 10/22/2014

Comment 1: The chapter is well-written and contains useful information. However, the chapter lacks discussions of

a. the benefits and impacts of the WY2014 Lake regulatory releases, and
b. the status of the rehabilitation of the Herbert Hoover Dike

Response: Thank you for your comment. The rehabilitation of the Herbert Hoover Dike is the responsibility of the U.S. Army Corps of Engineers and therefore is not included as a topic in the annual SFER.

Comment 2: XXX The District's 2005 SFER anticipated that the Lake's TMDL would be achieved by 2015, as mandated by the State's 2000 Lake Okeechobee Protection Act. What is the current estimate when the Lake's TMDL will be achieved?

Response: This question was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

Comment 3: A critical omission from the chapter is the documentation and discussion of the destructive impacts of Lake regulatory releases on the St. Lucie and Caloosahatchee Rivers and Estuaries. These releases were the subject of numerous WRAC and other public meetings, generated multiple citizen protests during which thousands of citizens expressed their outrage, resulted in the formation of a State Legislative Committee which held multiple public hearings, and was the focus of a federal Congressional hearing. During WY2014, more than 1,600,000 acre feet of Lake Okeechobee regulatory releases were discharged to the St. Lucie River and Estuary, the Caloosahatchee River and Estuary and the Lake Worth Lagoon.

- *a. Flows and Nutrient Loads from Lake Releases*
  - *i. St. Lucie River and Estuary:*
    1. *Flow - more than 418,000 acre feet*
    2. *Nitrogen – 1.43 million pounds - almost 6 times the TMDL*
    3. *Phosphorus – 154,000 pounds - almost 6 times the TMDL*
    4. *Total Suspended Solids – 19 million pounds (rough estimate)*
  - *ii. Caloosahatchee Estuary:*
    1. *Flow – more than 1,150,000 acre feet*
    2. *Nitrogen – 4.25 million pounds – 36% more than the TMDL*
    3. *Phosphorus – 236,000 pounds*
    4. *Total Suspended Solids – 20 million pounds (rough estimate)*
  - *iii. Lake Worth Lagoon:*
    1. *Flow - More than 100,000 acre feet*

2. Phosphorus - 37,800 pounds of TP

iv. Total to estuaries: 426,800 pounds of TP

b. By contrast, while the estuaries were being devastated by these destructive Lake releases, less than 170,000 acre feet of Lake Okeechobee regulatory releases were discharged to the Everglades – the pre-development destination for excess Lake water. These Lake flows carried only 5 metric tons of TP to the Everglades due to prior treatment in STAs … less than 3% of the load to estuaries. During this period, TP concentrations in the Refuge (WCA-1) ranged from 6-8 ppb, and inflows to Everglades National Park were approximately 8 ppb.

Response: Please refer to responses to Chapter 10, comments 2 and 2a. Also, this question was responded to previously (see attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth).

a. *Suggest the chapter document the water management operations during WY2014 leading up to the regulatory releases as well as documenting the volumes of water and the mass of nutrients and sediment discharged to the St. Lucie and Caloosahatchee River and estuaries.*

   Response: Please refer to response to Chapter 2, comment 1c.

b. *Suggest the chapter document the destructive environmental and economic impacts to the coastal regions associated with these releases, and compare those impacts to the benefits of the regulatory releases.*

   Response: Thank you for the suggestion. Please refer to responses to Chapter 10, comments 2 and 2a.

Comment 4: Another critical omission is discussion of the status of the rehabilitation of the Herbert Hoover Dike by the US Army Corps of Engineers (USACE). The destructive Lake regulatory releases to the estuaries during WY2014 are a product of the current LORS2008, which is a direct result of state and federal government's efforts to reduce the risk of dike failure.

Response: Please refer to response to question 1b above.

Comment 5: Line 115: Lake regulatory discharges were also made via Lake Culvert 10A into the L-8 Canal and eventually to Lake Worth Lagoon.

Response: Note that reporting on the Lake Worth Lagoon is outside the scope of the annual SFER. Please refer to responses to Chapter 10, comments 2 and 2a.

RESPONSES TO PUBLIC COMMENTS ON THE DRAFT 2015 SFER – VOLUME I, CHAPTER 10

Lesley Bertolotti, Christopher Buzzelli, Kevin Carter,
Peter Doering and Beth Lewis

Public Comments From*:* Dr. Gary Goforth, posted on the SFER WebBoard, 10/22/2014

Comment 1: The chapter is extremely well-written, comprehensive and contains very useful information for stakeholders: outstanding work by the authors. However, there are three omissions from the chapter which should be addressed in the final version.

Response: Thank you for your comment.

Comment 2: The first critical omission from the chapter is the documentation and discussion of the destructive nutrient and sediment loading impacts of Lake regulatory releases on the St. Lucie and Caloosahatchee Rivers and Estuaries. These releases were the subject of numerous WRAC and other public meetings, generated multiple citizen protests during which thousands of citizens expressed their outrage, resulted in the formation of a State Legislative Committee which held multiple public hearings, and was the focus of a federal Congressional hearing. During WY2014, more than 1,600,000 acre feet of Lake Okeechobee regulatory releases were discharged to the St. Lucie River and Estuary, the Caloosahatchee River and Estuary and the Lake Worth Lagoon.

a. *Flows and Nutrient Loads from Lake Releases*
    i. *St. Lucie River and Estuary:*
        1. *Flow - more than 418,000 acre feet*
        2. *Nitrogen – 1.43 million pounds - almost 6 times the TMDL*
        3. *Phosphorus – 154,000 pounds - almost 6 times the TMDL*
        4. *Total Suspended Solids – 19 million pounds (rough estimate)*
    ii. *Caloosahatchee Estuary:*
        1. *Flow – more than 1,150,000 acre feet*
        2. *Nitrogen – 4.25 million pounds – 36% more than the TMDL*
        3. *Phosphorus – 236,000 pounds*
        4. *Total Suspended Solids – 20 million pounds (rough estimate)*
    iii. *Lake Worth Lagoon:*
        1. *Flow - More than 100,000 acre feet*
        2. *Phosphorus - 37,800 pounds of TP*
    iv. *Total to estuaries: 426,800 pounds of TP*

Response: The purpose of Chapter 10 of this volume is to meet the legislatively mandated annual and three-year reporting required in Section 373.4595, Florida Statutes, which is specific to the Northern Everglades and Estuaries (St. Lucie and Caloosahatchee Estuaries). Reporting on the Lake Worth Lagoon is outside the scope of the annual SFER; information on the Lake Worth Lagoon is reported through the Lake Worth Lagoon Initiative, which is available online at http://www.pbcgov.org/erm/lwli/water.asp.

The focus of protection plans for both estuaries is meeting freshwater inflow targets and envelopes and meeting Total Maximum Daily Loads (TMDLs). As TMDLs for nutrients have been established for both systems, hydraulic loads and nutrient loads from the local watershed and Lake Okeechobee are reported for both systems. Given that TMDLs for sediments do not exist, sediment loads were not reported. However, the agency will consider including evaluating total suspended solids (TSS) loading from the lake and the watershed as potential future research project components of the River Watershed Research and Water Quality Monitoring Plans.

The impacts of high freshwater inputs and nutrient loading from the lake and the watershed on water quality and aquatic habitat (seagrass and oysters) to the systems are reported for the Caloosahatchee and St. Lucie Estuaries in the Hydrology, Water Quality and Aquatic Habitat Sections of the chapter. As discussed in Appendix 10-2 of this volume, a quantitative assessment of the linkages between freshwater outflows from Lake Okeechobee and the coastal watersheds to water quality attributes [chlorophyll a (CHL), total nitrogen (TN), and total phosphorus (TP)] in the St. Lucie and Caloosahatchee Estuaries is proposed as a future research project. Please note that implementation of this assessment is subject to funding and staffing resources. For additional quantitative assessment of impacts from Lake Okeechobee releases associated with the Lake Okeechobee Regulation Schedule (LORS) on the Northern Estuaries, please refer to the Environmental Impact Statement and Biological Opinion performed for the Lake Okeechobee Regulation Schedule.

b. By contrast, while the estuaries were being devastated by these harmful Lake releases, less than 170,000 acre feet of Lake Okeechobee regulatory releases were discharged to the Everglades – the pre-development destination for excess Lake water. These Lake flows carried only 10,100 pounds of TP to the Everglades due to prior treatment in STAs … less than 3% of the load to estuaries. During this period, TP concentrations in the Refuge (WCA-1) ranged from 6-8 ppb, and inflows to Everglades National Park were approximately 8 ppb.

Response: Fundamental to the amount of water sent south are the authorized purposes, established operational protocols and limited flexibility of the Central & Southern Florida Flood Control (C&SF) Project as well as the U.S. Army Corps of Engineers (USACE) LORS 2008. In addition, several significant policy and legal issues relate directly to this topic. These were discussed in the attached May 2, 2014 letter from Jeff Kivett, SFWMD, to Dr. Gary Goforth.

c. Suggest the chapter document the water management operations during WY2014 leading up to the regulatory releases as well as documenting the volumes of water and the mass of nutrients and sediment discharged to the St. Lucie and Caloosahatchee River and estuaries.

Response: Water management operations for WY2014 are summarized in Chapter 2 (South Florida Hydrology and Water Management) of this volume.

d. Suggest the chapter document the destructive environmental and economic impacts to the coastal regions associated with these releases.

Response: Regarding environmental impacts please see responses to comments 2 and 2a above. An economic impact analysis is beyond the scope of the annual SFER.

e. Nutrient and sediment loads to the estuaries are not currently presented as part of the monthly staff updates to the Governing Board – could they be included?

Response: Note that this comment does not pertain to Chapter 10 of this volume.

Comment 3: Line 89: Dispersed Water Management Projects ("DWMPs")

a. Suggest that references to storage volumes from DWMPs include the estimated reduction in flows and nutrient loads ***at the Lake (or estuary)*** *instead of just presenting the estimated storage at the project location, since the attenuation between the project location and the Lake (or estuary) may render any project benefits moot. Intuitively, the attenuation factor (defined as the measured flow reduction at the waterbody divided by flow reduction at the DWMP site) would be 1.0 for a DWMP located on the waterbody, and decreases to 0 the farther upstream the project site is located due to water reuse and floodplain losses/attenuation.*

b. At the January 2014 Governing Board meeting, the SFWMD Executive Director told the Governing Board he had directed staff to perform an evaluation of the DWMPs to ensure they are truly effective at reducing flow and removing nutrients from the waterbody of interest. When will the results of this evaluation be available?

c. Table 10-1 estimates annual storage benefits of DWMPs.

i. Are discharges being monitored for flow and nutrient loads?

ii. What are the ***actual*** *annual reductions measured at the project location and at the downstream waterbody?*

iii. Are the landowners held accountable for achieving the estimated annual benefits, i.e., if the projected benefits are not achieved, what are the ramifications?

iv. What is the current annual volume of water being discharged from the lands to be used as the DWMP?

v. How were the flow reductions estimated?

vi. Are the estimated reductions projected for Lake Okeechobee (or the River basins), or estimated reductions from the landowner's property? As you know, in general the further the discharge point is from the Lake, the smaller the actual flow reduction would be.

vii. Are these reductions permanent, i.e., the water will be held and used on site, or temporary, i.e., released back to receiving waters after a storm event through surface or groundwater discharges?

viii. How will the actual flow reductions be monitored?

ix. What accountability for achieving the estimated flow reductions does the District place on each DWMP? For example, if the actual flow reductions do not meet the estimated flow reductions, will the landowner return a portion of the public funds paid for the DWMP?

d. What are the nutrient reduction benefits of the DWMPs listed in Table 10-1 ***measured at the Lake or estuary****?*

i. How cost effective are the projects listed in Table 10-1 relative to regional treatment projects such as an STA? How were the load reductions estimated?

ii. Are these reductions permanent, i.e., the water will be held and used on site, or temporary, e.g., released back to receiving waters after a storm event?

iii. How will the actual nutrient load reductions be monitored?

iv. If the actual nutrient load reductions do not meet the estimated load reductions, will the landowner return any of the funds paid for the DWMP?

v. What accountability for achieving the estimated nutrient load reductions does the District place on each DWMP owner?
vi. What is the current annual phosphorus load and phosphorus concentration in waters being discharged from the lands to be used as the DWMP?
vii. What is the current Works of the District (e.g., 40E-61) permit limit for phosphorus for the same land?
viii. When evaluating DWMPs, does the District consider whether or not the property is meeting the existing Works of the District permit condition?

e. For each DWMP listed in Table 10-1:

i. What is the total cost, separated into initial cost and continuing costs?

ii. If the landowner has a consumptive use permit, or a pending permit application,

1. What is the maximum annual volume of water allocated by the permit, or requested in the permit application?

2. When evaluating DWMPs, does the District consider whether or not the landowner has a consumptive use permit, or a pending application?

f. In their October 2013 Board presentation, District staff reported that the average cost for a DWMP was $163 per acre foot of water per year.

i. What basis did the District use to establish this value as a fair cost?

ii. Has that average cost been revised? If so, what is the current average annual cost per acre foot of water per year?

g. The latest 5-year average annual phosphorus loads discharged to Lake Okeechobee exceeded 420 metric tons, more than four times the Total Maximum Daily Load (TMDL) established for surface water inflows to Lake Okeechobee. The District has a Lake Okeechobee Protection Plan, which contains water quality projects that will reduce the nutrients entering the Lake. According to staff's presentation at the January 2014 Governing Board meeting many of these projects are not being completed due to insufficient funds.

i. Which projects in the District's Plan could be implemented if the funds obligated to the DWMPs were instead expended to finish the projects?

ii. What is the estimated average cost per pound of phosphorus removal for the water quality projects in the Lake Okeechobee Protection Plan?

iii. How do these costs compare to the unit costs for the DWMPs?

iv. Are the DWMPs located in tributaries identified in the Protection Plan as needing additional storage?

v. The District's 2005 annual report anticipated that the Lake's TMDL would be achieved by 2015, as mandated by the State's 2000 Lake Okeechobee Protection Act. What is the current estimate when the Lake's TMDL will be achieved?

Response: Dispersed Water Management (DWM) projects are temporary in nature, and the program was developed as an interim means to store water until larger regional projects come on line. Most of the projects involve temporary contracts with private land owners that can be terminated for convenience by either party at any time. While these interim DWM projects are implemented, the coordinating agencies are pursuing funding and the legislature continues to fund other larger regional projects (see the Working Collaboratively to Identify Funding Opportunities in the *Strategies Moving Forward* section of this chapter). The coordinating agencies are committed to restoring Lake Okeechobee and its watershed, continuing existing efforts, and identifying new opportunities to improve the ecosystem.

Several of the DWM questions noted above have been raised by others and are pertinent to the future direction and focus of the DWM program, and assist with policy decisions. It is important to note that the DWM program is a relatively new program, which has evolved greatly in the past few years, and continues to evolve as new information/data is available. This past year, District staff developed a programmatic work plan with key activities which will help answer several key questions. These activities are summarized in **Table 10-10** of the chapter. Some of the key tasks, such as the suitability analysis and cost effectiveness, will be addressed through the District's storage needs north of the lake analysis, which was kicked off in mid-2014 and is currently under way; this is expected to take 1.5 to 2 years to complete. The other activities presented in the table have been initiated. Once information obtained from these analyses is available, it will be shared via Governing Board meetings, Water Resources Advisory Commission meeting, and annual SFER reporting, as appropriate.

The District suggests consulting the Draft Basin Management Action Plan (BMAP) for Lake Okeechobee concerning questions related to water quality for Northern Everglades – Payment for Environmental Services (NE-PES) projects and other DWM projects located in the Lake Okeechobee Watershed. The District is currently conducting a pilot project program for water farming on fallow citrus lands in the St. Lucie River Watershed; water quality data collection from the operational projects is in its initial stages. It is anticipated that representative water quality monitoring of DWM projects in general will occur due to the need to meet nutrient reduction goals associated with the BMAP process for both the St. Lucie and Caloosahatchee River watersheds.

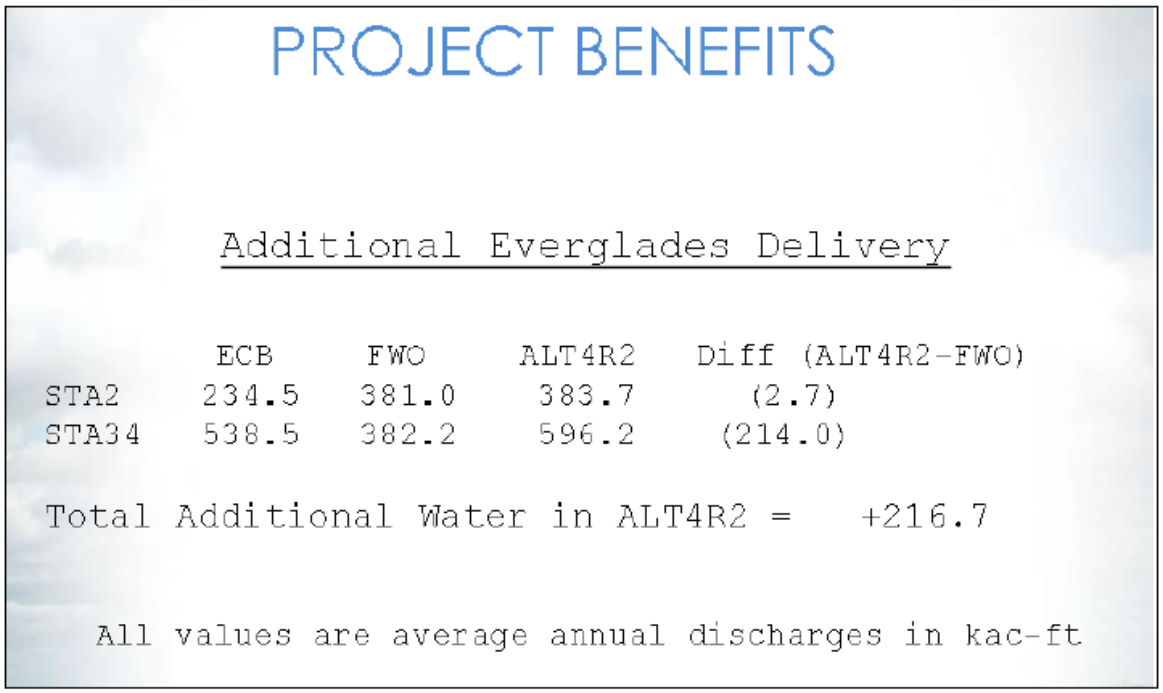
Comment 4: Line 2061: A second critical omission in the St. Lucie River Watershed Protection Plan (SLRWPP) is the lack of a project to treat Lake Okeechobee regulatory releases prior to discharge into the St. Lucie River and Estuary. Without a dedicated project to remove nutrients from Lake Okeechobee releases to the St. Lucie River and Estuary, there is no possibility of achieving the TMDL for the C-44 Canal, or achieving the desired nutrient concentrations in the estuary.

Response: Thank you for your comment.

Comment 5: Central Everglades Planning Project (CEPP). A third critical omission is lack of clarification on the benefits of CEPP to reducing Lake releases to the estuaries.

a. *Line 1064:*
    i. *Suggest that all mention of additional Lake water to the Everglades through CEPP elements document the absolute value of Lake water sent to the Everglades, since it isn't clear what the "additional flow" is relative to. For example, in the August 2013 WRAC presentation (see below), what is the estimated Lake releases to the Everglades in the "FWO" scenario, and what is the estimated Lake releases to the Everglades in the "ALTT4R2" scenario? Doesn't the FWO scenario include 250,000 acre feet per year of Lake releases to the Everglades? This section conflicts with information presented in Line 2427, which states the absolute magnitude of Lake releases to the Everglades is only 210,000 acre feet (average annual) – well below the (250,000 + 215,000 = 465,000 AF/yr) estimate.*

ii. *What are the projected reductions in Lake releases to the estuaries as a result of CEPP? As you know, there is not a 1:1 relationship between the quantity of additional Lake water sent to the Everglades and a reduction in Lake water sent to the estuaries.*



Source: SFWMD presentation on CEPP at the August 8, 2013 WRAC meeting

b. *Line 1064: Suggest that any mention of additional Lake water to the Everglades through CEPP elements clearly state any water quality constraints, e.g., SFWMD staff Tom Teets stated to the Governing Board that additional Lake water will be sent through CEPP elements only if the WQBEL is met. Since no STA has ever achieved the WQBEL over a 5-yr assessment period, there is reason to doubt any additional lake water will be sent to the Everglades, and the entire $1.8 billion CEPP project will be used solely for conveying EAA runoff.*

c. *Line 2427: This information (210,000 AF/yr of Lake releases to the Everglades) conflicts with the information beginning on line 1064 – "additional 215,000 AF/yr"*

Response: The purpose of this section was to provide a high-level overview of the projects that will assist in reducing damaging flows to the estuaries. In the final version, the following text will be added in this section: "Further information on CEPP can be found at www.evergladesplan.org." The af/yr discrepancy also will be corrected in the final version.

Comment 6: Lines 1353, 1433, and 1448: Suggest that these discussions include Lake Okeechobee regulatory releases since they are a dominant source of flow, nutrient loads and sediment loads to the rivers and estuaries.

Response: Please note that the contribution of all surface water flows to the estuaries (magnitude and percentages), including Lake Okeechobee, are included in **Figures 10-16** and **10-28**. These figures show that the flows and loads from the river watersheds comprise approximately 70-80 percent of the overall surface water flow and nutrient loading to the St. Lucie Estuary and approximately 60-75 percent for the Caloosahatchee Estuary. The pie charts in **Figures 10-17** and **10-29** were created to provide a more detailed watershed analysis and examine the relative comparisons between the spatial extent, flows, and loads from each of the sub-watersheds or basins that comprise the St. Lucie and Caloosahatchee River watersheds.

Comment 7: Line 1638: Similar comments apply to the CRE as was provided for the SLRE above regarding documenting the impacts of the WY2014 Lake regulatory releases.

Response: Please refer to response to comment 6 above.

Comment 8: Line 2191: C-44 Project.

a. *Please cite and make available the technical reports documenting the estimated nutrient load reductions of the C-44 project.*

8a Response: The reports and their links are provided below.

a. Indian River Lagoon-South PIR - http://www.evergladesplan.org/pm/studies/irl_south_pir.aspx
b. Basis of Design Report dated April 14, 2006 - https://webtop.cerpzone.org/rog_acq/drl/objectId/0b009f578012724d
c. C-23 Canal Preliminary Phosphorus Trend Evaluation - https://webtop.cerpzone.org/rog_acq/drl/objectId/0b009f57800e5880
d. Florida Reservoir and Lake Water Quality Analysis - https://webtop.cerpzone.org/rog_acq/drl/objectId/0b009f5780127258
e. DMSTA Simulation Technical Memorandum - https://webtop.cerpzone.org/rog_acq/drl/objectId/0b009f57800e5820

b. *Please cite and make available the technical reports documenting the estimated flow reductions of the C-44 project.*

8b Response: The C-44 reservoir has a static storage volume of 50,600 acre-feet, with inflow capability of 1,100 cfs and outflow capacity of 600 cfs. For more details, please refer to the Project Implementation Report (at the link provided above), and the water budget model and report (previously provided via District e-mail to G. Goforth, dated July 15, 2014.

c. *Since the C-44 Project is not authorized to capture and treat Lake Okeechobee releases, what is the estimated volume of Lake water that may incidentally be captured and treated by the project?*

8c Response: For clarification the project objective of the C-44 Reservoir Assisted STA is to capture C-44 Basin run-off. While capturing Lake Okeechobee water is not a specified project objective, and therefore not explicitly determined, it may capture Lake Okeechobee water as an incidental benefit. The volume of this incidental benefit would depend upon a number of factors, including the stage in the reservoir, the amount of basin flow, and amount of water discharged from Lake Okeechobee.

d. When will the operations plan for coordinating the operations of S-308, C-44 inflow/outflow pumps and S-80 be developed?

8d Response: A Draft Operations Plan was written during the initial design of the C-44 project. The Operations Plan will be updated and modified as needed during the C-44 Project construction based on the C-44 project construction sequencing.

Comment 9: Line 2248: Will the activities identified in Table 10-10 be completed before additional public funds are allocated for DWMPs? If not, how can the SFWMD justify expenditure of public funds for projects that may not be effective, cost-effective, or helpful to achieving the nutrient reduction goals of the River Protection Plans?

Response: Please refer to response to comment 3 above.

RESPONSES TO PUBLIC COMMENTS ON THE DRAFT 2015 SFER – VOLUME III, APPENDIX 3-1

Seán Sculley

Public Comments From: Dr. Gary Goforth, posted on the SFER WebBoard, 10/22/2014

Comment: *One structure with arguably the lowest TP concentration leaving STA-3/4 is G-388 (the PSTA outflow pump station; see Figure 2), which has exhibited annual flow-weighted mean concentrations ranging from 8 to 13 ppb for the last six years. Why isn't this structure listed in Table 3-1? Why isn't this structure listed in the EFA Watershed permit or the NPDES permit for the STAs? Is the District operating outside the authorization of these permits by discharging through the structure? Why doesn't the District request a permit modification to include this structure in those permits?*

Response: In the final version, flows from G-388 will be included in Table 6 as an outflow structure and water quality from station G-379D (demonstrated to be representative) will be applied to G-388 flows, as stipulated in the EFA permit. Note, in WY2014, G-388 flows were 0.8% of total flows from STA-3/4.

G-388, the outflow pump station of the PSTA (Periphyton Stormwater Treatment Area) Implementation Project in flow-way 2 / central flow-way of STA-3/4, is listed in the EFA and NPDES permits as one of 18 discharge structures in STA-3/4 (see EFA permit number 0311207, page 6; NPDES permit number FL0778451, page 2).

The District operates within the authorization of the STA EFA and NPDES permits issued by FDEP when discharging through G-388. The STA permits do not require the use of water quality data collected at G-388. Therefore, a permit modification is not necessary.