Appendix 1-1: Peer Review Panel Comments on the 2003 Everglades Consolidated Report

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

With the Exception of reformatting some of the information for better readability, the appendices were not edited or spellchecked by the ECR production staff and appear as posted on the District's WebBoard.

Posted on the SFWMD WebBoard September 17, 2002 10:40 AM

OVERALL COMMENTS ON CHAPTER 1 by Joanna Burger

This is an excellent overview and introduction to the report. Several things might be elaborated a bit more in this chapter, including 1) effect of phosphorus inputs in Florida Bay, 2) noting that although there has been a general long-term decline in wading birds, there has been an increase in the last 2 years, 3) whether the District will meet the Dec 31 2003 deadline to achieve compliance (page 1-12), and 4) when the phosphorus criterion will be adopted. The SFWMD is to be congratulated on the creation of an excellent Consolidated Report.

Posted on the SFWMD WebBoard September 17, 2002 10:46 AM

OVERALL COMMENTS ON CHAPTER 2B by Joanna Burger

OVERVIEW

This year's Mercury Monitoring, Research and Environmental Assessment chapter is an excellent overview of the mercury problem in the Everglades, and how the SFWMD has addressed concerns about environmental problems in the Everglades. The data, models and conclusions in chapter 2B reflect the complex problem as faced by many agencies dealing with mercury in freshwater ecosystems. The authors are to be commended on writing a chapter that is very readable and accessible to a broad range of readers. It accurately and fairly reflects the state of the knowledge about mercury fate and effects, mercury cycling in the Everglades, and the potential for receptor problems, including humans who consume fish from these waters. While, the risk to human consumers initially drove the lowering of mercury in the Everglades system, concern for piscivorous wildlife quickly came to the fore.

This year the report is organized to more directly address the major concerns of agencies and stakeholders regarding the sources, fate and effects of mercury (and methylmercury) on the food chain in the Everglades. It is much clearer, more readable, and easier to follow than previous chapters, and the authors have done a good job with it. The initial summaries and conclusions fairly represent both the current state of knowledge, as well as unanswered questions and research needs.

The report is a very scholarly treatment of the problems of mercury, and would be well-served by more citations to the original reference. It is not always clear to the reader, and certainly not to the public, which statements are fact versus conjecture, and which come from Everglades research vs other research. The increase in the number of citations in the text (compared to the 2002 Consolidated Report) is a major improvement, making it easier for scientists and the lay public to find original sources.

Many of the research needs as suggested by the Review Team in 2002 have been initiated. While it is disappointing that results are not yet available on the work at Patuxent Wildlife Research Center on the in-ovo effects of methylmercury, this research is extremely important in identifying sublethal effects that might be difficult to assess or monitor in field studies in the Everglades. In addition to hatchability and viability, this work should include sublethal behavioral effects in young chicks that might lead to their decreased survival in wading birds in the wild.

The continued study of the relative contribution of global versus local sources of mercury continues to be key to management and reduction of mercury to the Everglades. These efforts should continue as a major thrust for the SFWMD. The collaboration between state and federal agencies is key, and an important component to understanding mercury cycling in the Everglades and elsewhere. The modeling and data collection phase should continue beyond 2003 as the problem is ever changing. Further, with energy deregulation in the United States, longer-distance mercury transport has proven a problem in the northeastern U.S. Whether there is a comparable signal in South Florida, should be carefully monitored to contribute to our understanding of mercury exposure in the Eastern United States, as well as in South Florida, where there are not prevailing westerlies.

The other on-going research projects are important, particularly refinement of mercury cycling models that are dynamic rather than static. Continued examination of mercury trends in indicator wildlife is critical to continued management of the Everglades as this will provide early warning if there is a new or continuing problem.

The research emphasis on effect of water quality on methylmercury production is also key to understanding the risks to humans and wildlife from mercury. Many of the findings in this section are at the forefront of research and our understanding of methylmercury dynamics, and the SFWMD is to be commended for its overall research program. The role of passive versus active transport, and the role of iron should be further investigated.

The main body of the chapter accurately reflects the three main issues with mercury in the Everglades. This reorganization makes the report easier to read, and much for informative for stakeholders. Key issues discussed include:

1) the relative contribution of local vs long-distance atmospheric transport of mercury into the Everglades system
2) the factors that affect the transformation of mercury into methylmercury.
3) the effect of current methylmercury levels on receptors, notable piscivorous fish and wildlife.

THE ATMOSPHERIC MERCURY CYCLE
Discussion of atmospheric mercury cycling is key to understanding the mercury problem in the Everglades, and this section states the problem clearly. In this regard, the continued monitoring and modelling of local versus long-distance atmospheric deposition is critical to continued understanding of both the mercury cycle and management of mercury levels in the Everglades, particularly because of the potential effect of energy deregulation on mercury loadings in the Eastern United States. Refinement of these relationships is key to management.

Continued refinement of the models to understand the time lag between decreases in mercury emissions and abatement of the mercury problem in the Everglades continues to be an important issue worth examining.

Of all the issues in 2B, this is one of the most controversial, largely because it is difficult and time-consuming to obtain the data necessary to answer the key questions. It is not clear why the first bullet on the Everglades coring study is evidence for a local source, since it is not evident that other controls were conducted from elsewhere. This aspect requires further examination and possible study.

While most of the information presented to examine local vs global sources for the atmospheric mercury deposition is straight-forward, I am uneasy with some aspects. Namely, it would be better to have data from the southern US instead of the northern Atlantic since atmospheric wind patterns differ in the northern and southern US. Background sites should be nearer to southern Florida, where atmospheric deposition is more directly comparable. Even with the Davie study, the case is not clear because Ft. Lauderdale is potentially part of the coastal input to the Everglades. In conclusion, the data marshalled are excellent, but more data and analysis are necessary to distinguish sources and to assign a percent to local vs global sources. Perhaps bounds could be placed on the estimates at the bottom of page 2B-15. Source reductions in South Florida, in figures 2B-5 and 2B-6 are impressive. There is activity in the United States to address regional pollution problems, but being in a prevailing Easterly zone, this may not impact Florida as much as it would help the northeastern States. How much would efforts to reduce Hg

emissions in Texas, the Gulf States, north Florida, etc, contribute to reducing deposition in and around the Everglades. It might be useful to examine this aspect.

PHOSPHORUS AND MERCURY

This section is an excellent idea, as it clearly states the issues involved, and the data that pertain to these issues. It is much clearer and easier to follow, making it more useful for the general public. Addressing the concerns of the sugar growers directly is important, and makes it clear that all scientific ideas and data were considered in the section on the effects of phosphorus. The mesocosm studies are excellent, and can be used to tease apart the variables, which then need to be field tested in some of the STAs.

It will be important to examine as many of the indirect effects of changes in phosphorus levels as possible. The effect on enhanced plant growth, and then on methylmercury could be important. In that regard, further study on Cell 1 to understand the anomalous results of mercury might provide information valuable for the entire system - it suggests some factor is not currently being accounted for.

Further, the separation of the data and conclusions about the effects of phosphorus on methylation, and on bioaccumulation has clarified the major issues, both for the Everglades, and for scientists generally. The dynamic nature of the multi-factorial models for understanding mercury bioaccumulation are extremely important to achieving predictive results. It may be important to try to put bounds on the relative percent contribution of the different factors that affect bioaccumulation. What is the relative importance of sulfur chemistry, drying and wetting, phosphorus chemistry, hydrology and biodilution? More modelling may be required to fully understand these relationships.

As these models are being refined, ongoing validation or "ground-truthing" is needed, especially the comparison of model results with measured mercury in the different physical and biotic compartments. The value of these efforts will increase if they are able to model the effects of different levels of sulfur in conjunction with the hydrology, water quality (phosphorus, oxygen) and restoration activities. It is the possible synergisms that are critical to understand.

ECOLOGICAL RISK TO EVERGLADES WILDLIFE

Again, the organization of this years Consolidated Report makes the key questions obvious. Ecological risk to wildlife is the primary driver, and to address it directly is ideal. Again, dealing directly with the species (or species groups) at risk is critical. Top-level predatory fish, wading birds, alligators, and humans are the species at risk, and examining both mercury levels and effects in these species is important.

While it is important to address all stressors on wading birds (and on other indicators), particularly for ranking risks and management issues, it is still key to pursue a research strategy that continues to explore the role (both directly and indirectly) of mercury on behavior, survival and reproductive success. In most cases, as in the Everglades, direct habitat loss trumps all other stressors. However, this does not diminish the importance of understanding the role of mercury, and reducing its effect (as is being done by source reduction).

The results of the Workshop by the Peer-review Panel should be described in a bit more detail. The SFWMD went to a great deal of time and effort to examine these questions, and they should be more fully described. I concur with their findings that other species at risk, such as bats and alligators, should be exposed to rigorous risk assessment. The table (2B-2) on mercury concentrations in alligators is very useful both for scientists and the public - similar tables for

mercury in egret feathers and in bass from elsewhere would be useful in the future to put the Everglades picture in perspective.

While at present the risks to wading birds seem small, it is imperative to complete the studies on developing embryos, and on neurobehavioral effects that could affect survival and ultimately reproductive success. In this regard, it should be noted that the conclusion that there is no evidence that wading birds are affected by mercury needs to be stated more cautiously. Given all the factors that affect reproductive success, it is very difficult to show effects of contaminants, unless there are massive declines (as there were with DDT), or physical abnormalities (as there have been in the Great Lakes with colonial-nesting birds). The Spalding/Frederick work clearly shows that when fed fish at levels that occur in the Everglades there are some effects. Further they have shown that the potential for accumulation in the feathers somewhat buffers them. The recent paper by Frederick et al. (2002) on wading birds as bioindicators should be included as it provides additional information on the likelihood that wading birds are no longer at risk. In addition, the work of G. Heinz, presented in an abstract at SETAC, suggests that the eggs of wading birds may be more vulnerable than Mallards, on which most of the risk assessments have been based. A more complete report of this study should be included in the Consolidated Report.

The risks to top-level predatory fish might also bear some experimentation, since it is possible that there are sublethal effects on eggs or young fry.

QUESTIONS AND SPECIFIC COMMENTS FROM 2B from J. Burger

1. Page 2B-1. In the first bullet of the summary, it might be helpful to list the percent assumed to be from local atmospheric deposition sources (compared to global).
2. Page 2B-4. Are any data available from the EDXRF?
3. Page 2B-6. A better description of the differences in the effect of temperature on methylation compared to decomposition might be useful.
4. Page 2B-6. Is the question of the uptake of inorganic mercury-sulfide complex passively or actively being further examined - if so, need a reference to where to find it in the report.
5. Page 2b-6. The role of iron clearly needs more work, is any being done?
6. Page 2B-14. The first bullet - it is unclear how this supports a local source, since it is not clear whether controls from elsewhere in Florida were used to determine global transport. That is, normally deposition in one place is compared with deposition in another to determine local sources by substraction.
7. Page 2B-14. What accounts for the difference in Dvonch et al's estimate and Guentzel's?
8. Page 2B-14 - Is there another, published source for Schroeder? Again, data from the southern US are needed to compare with Florida.
9. Page 2B-20 - what are the exact consumption advisories (species, amount). Might be good to include them here.
10. Page 2B- last paragraph in sugar cane growers cooperative - you might add that the evidence is presented below. As it is, the reader is left hanging about the nature of the evidence.
11. Page 2B-23 - Is anyone looking at the effects of phosphate on plant growth?
12. Page 2B - 26. Are the Gambusia data all from the same location (where inorganic and organic mercury were help constant)?
13. Page 2B - 29. Are further studies of the anomalous conditions in cell 2 being examined. 14. Page 2B - 30. It might be useful to provide some of the data on algae growth and biodilution, just as has been provided for other aspects.

15. Page 2B - 31. References are needed for some of the statements in the first paragraph under "the likely effect..." In the next paragraph, statements such as "previously published" require a citation.
16. Page 2B - 37. - What are the baseline MeHg risks for wading birds? Where are these data? What was considered baseline? From the Everglades or elsewhere? One way to compare mercury levels in feathers of egrets, for example, is to compare them to levels for a series of similar species from elsewhere around the country. This could be done with the table in Burger and Gochfeld 2001.
17. Page 2B - 38. Top paragraph implies that egret eggs have been collected, but it is unclear whether they have been or are being analyzed (or just being archived).
18. Page 2B - 39. A fuller explanation of the mercury trends should be included.
19. Page 2B - 45. "within a generation" is unclear. Of humans or wading birds. Might be better to say 20 years or whatever you mean.
20. References - Some of the references say et al., and it would be more useful to include all the names of authors.

References to Include in chapter 2B

Frederick, P. C., M. G. Spalding and R. Dusek. 2002. Wading birds as bioindicators of mercury contamination in Florida, USA: annual and geographical variation. Environ. Tox. Chem. 21:163-167.

Burger, J. and M. Gochfeld. 2001. Effects of chemicals and pollution on seabirds. Pp 485-525 in Biology of Marine Birds (Ed. by E. A. Schreiber and J. Burger). CRC Press, Boca Raton, FL.

Posted on the SFWMD WebBoard September 17, 2002 10:49 AM

COMMENTS ON CHAPTER 4A by Joanna Burger

The anomalous mercury event in cell 1 of STA-2 (page 4A-29) is an important section. The standard for "high mercury concentrations" should be stated for the general public. The concentrations of mercury in the water that prompted the naming of the event should also be given. How many samples was this based on, over what time and spatial scale? Since the drawdown took so long, was there wading bird foraging during this period (fish must have been concentrated, usually a draw for wading birds).

Was the drawdown complete so that all the fish with high levels were killed? What is the current water level in that cell?

I would suggest that in addition to the studies, some attention should be directed at determining how fast methylmercury moved up through the food chain to small fish and ultimately bass, bowfin and sunfish. What is the lag time, and how early is it essential to identify the beginning of the mercury increase in cell 1 (or elsewhere), and is there sufficient monitoring to detect it in other cells? This is particularly important since this was not the first such event. The in situ mesocosm study seems essential to understanding MeHg production here.

Posted on the SFWMD WebBoard September 17, 2002 10:53 AM

COMMENTS ON CHAPTER 4B by Joanna Burger

Overall this section provides a clear picture of the research and on-going data needs for STA optimization. One of the main questions that requires continued study is the effect of hydrological anomalies, such as extreme flooding or drought conditions. A few questions follow:

1. Page 4B-2. What is nature of the seepage from the levee, and will this continue, with what effects.
2. Page 4B-6. The retention of over 70 % of the TP is impressive, but it is unclear how this can be the case when it seems that the TP flowing from the system is increasing. Where is this coming from? This suggests that future monitoring is absolutely essential, particularly to determine the upper limit for TP outflow, and the conditions when it is high.
3. Page 4B-8. I wonder about extrapolation from the 0.4 hectare test cells to the large STAs? Is there a way of knowing that they functions similarly and predictably?
4. Page 4B-9. Is the use of the 10 year record sufficient to include possible outlyers?
5. Page 4B-10. It might be useful (at the top) to briefly summarize the scaling artifacts that might be applicable to the Everglades system.
6. Page 4B-11. In future experiments it might be better to try and have the orifice sizes for the inflow pipes mimic the actual STA design so that this is not a confounding factor.
7. Page 4B-12. What might account for the difference in pattern in June through November?
8. Page 4B-17. The pulsing experiments seem to be providing useful information, and should be continued under a wider range of hydrological conditions.
9. Page 4B-18. Again, comparing the cell work with the STAs is extremely important in allowing future extrapolation within and among the systems.
10. Page 4B-18. The extreme drought conditions make these results both extremely interesting, and atypical.
11. Page 4B-20. I found these graphs hard to follow and interpret.
12. Page 4B-25. Some explanation of the problem of overloading, and how this will relate to the overall STA functioning needs to be explained more clearly.
13. Page 4B-26. Are there data on phosphorus and methylmercury levels in STA-6, which was once used by the sugar growers?
14. Page 4B-28. A further explanation of the differences (19 vs 26 % would be useful).

Posted on the SFWMD WebBoard September 17, 2002 10:54 AM

COMMENTS ON CHAPTER 6 by Joanna Burger

The shift in emphasis of the SFWMD from phosphorus cycling and a phosphorus threshold is timely and scientifically justified in light of the importance of understanding fully the hydrological cycle and needs of the Everglades. This chapter fairly examines the state of these issues and future needs.

Questions and comments follow:
1. Page 6-1. Was there a lag time in any aspect of the drought? And have there been observable lag times in the past that makes this event different>
2. Page 6-2. It might be useful to state upfront why increased flow to Florida Bay may be negative, and to what components (vegetation, fish)?
3. Page 6-2. On what basis were the species selected for examination?
4. Page 6-2. Can the wading bird numbers be put in context with those of the rest of Florida or the southeast. In other words, were there more nesting birds in the total region, or just a shifting into the Everglades? In some years birds may not breed, so there could be an increase in the percent of birds nesting without an increase in total populations.
5. Page 6-17. Are there historical data to indicate what salinity was in Florida Bay before this total disruptions to the Everglades? A decade may not be long enough.
6. Page 6 -20. The section on Florida Bay and the CROGEE is particularly clear and insightful (as well as documented). Are there published papers on the secondary effects on coral reefs - might be useful to add.
7. Page 6 -21-22. The shift in nesting locations of the wading birds in the Everglades is not negative; it may well reflect the more traditional pattern. Colonial species switch locations as conditions dictate. What is essential is that there be a range of conditions so that all species find appropriate nesting sites each year. Only if there were a dramatic shift in reproductive success associated with the shift itself is there cause for alarm. Where did the base low/high come from, and how was it determined?
6. Page 6-23. Is there a relationship between burrow depth for crayfish and wading bird foraging or success?
7 Page 6-26-28. Very useful information. However, it is not clear from the descriptions what the key questions are that should be examined in the future. Perhaps three or four key indicator species should be selected for in-depth study to determine the effect of changes in tree islands or hydrological regime would have on them (and by extension, other similar species).
8. Page 6-46. Is decomposition being examined as well?

Posted on the SFWMD WebBoard September 24, 2002 1:01 PM

Review of Chapter 4A: STA Performance and Compliance
(Y. Ping Hsieh, Florida A&M University)

This is a well-written document in term of descriptive results. It would be helpful to add a brief history of vegetation population dynamics (including species composition and density over time) since the STA has been operational. Also an overall comparison of the STAs performance would be quite desirable. Following are my specific questions:

Has the vegetation population and composition stabilized since the STA-1 west was operational?

What are the criteria for undesirable vegetation?

What is the magnitude of evapotranspiration with regard to the total water budget in the STA-1 west?

What is the dominating factor that governs the level of dissolved oxygen in STAs?

4A-46, Fig 4A-25, Where did you get the outflow P concentration when there was no outflow?

What is a typical period for a STA to be stabilized? After that period does the performance stay unchanged?

Posted on the SFWMD WebBoard September 23, 2002 9:05 AM

Review of Chapter 4B: STA Optimization
(Y. Ping Hsieh, Florida A&M University)

This is a well-written document in term of descriptive results. A brief account of the results in the opening section would be desirable. The results of the low-, high- and pulsed water-depth experiments demonstrate that P removal efficiency of the STAs is basically inflow P concentration dependent. That is, the P removal efficiency is higher when the inflow P concentration is high. What is the main mechanism of the P removal in the STAs?

What are the forms of P retained in the STAs? (Vegetative biomass? Soil organic P? Inorganic P?).

How is the expected P removal performance in the STAs over time?

The dissolved P is mainly in inorganic forms in most cases. If the proportion of organic P increased, does it affect the P removal performance of the STAs?

Posted on the SFWMD WebBoard September 23, 2002 9:05 AM

Review of Chapter 6: Hydrologic needs-effects of hydrology on the Everglades Protection Area (Ping Hsieh, Florida A&M University)

Research on the hydrology of Everglades must be encouraged because many biological and biogeochemical processes are hydrologically driven or mediated. The task, as demonstrated by Chapter 6, is extremely complicated that requires great deals of skills and experience to do the job. I appreciate the effort of the workers, who put together this complicated subject matter, even though "this report does not, as this time, quantify the hydrologic needs of the Everglades". It will be beneficial to readers, if specific objectives of each experiment or investigation could be stated clearly in the report. A brief review of hydrological inter-connection among elements of wetland ecology such as: vegetation, biogeochemistry, erosion, sedimentation, salinity, microbiology and nutrient cycling would be very helpful to readers as well. A consistency in unit (metric or English) throughout the chapter is more desirable. Followings are my specific commons and questions:

6-1 Summary: Line 10 should be "a long-term study" rather than "study and patience".

6-1 Are inflows controlled or spontaneous? What is the relationship between rainfall and inflow rate in each area?

6-2 Why increase N loading stimulates algal bloom? Does it mean that P is not limiting?

6-2 Line 25, It is "methods for decomposition measurements" not "decomposition techniques".

Hydrological trends

Why water retention (or residence) time is not included in the discussion of this chapter? It is a very important hydrological consideration of any wetland system.

Is the water depth of NSM served as a control in the experiments? Why?

Salinity patterns in Florida Bay

According to the top portion of Fig. 6-6, it is hard to believe that freshwater flow of Taylor Slough and C-111 wetlands had no relationship to the salinity of Eastern Florida Bay. There may be a little phase shift (delay), otherwise freshwater flows sync well with the salinity.

Ecological trends

Why No. of birds increased from 1994 to 2002? Is it hydrology or else?

Crayfish

I do not understand Fig. 6-7. What does a sample event represent?

Soils and sediments

Fig. 6-8 and Fig. 6-9 should be under the sub-heading of Soils and Sediments not under Herpetofanna of Tree Islands.

What does the lower part of Fig. 6-9 represent?

6-30, Soil organic matter formation is from both aboveground and belowground productions not just belowground production.

6-31, Paragraph 2, "After burning, samples were analyzed for ash and organic matter content." What do you mean by that?

6-31, Para 5, I could not see from Fig. 6-8 that negative elevation change had occurred. It appeared that elevation might have been increased at dry environment and constant at marsh and Flooded environments. Also, the statement of the last sentence is contradictory to the results of statistical analysis.

6-32, The results suggest that the dry, marsh and flooded environments are generally keeping pace with the relative sea-level rise by sedimentation and OM building (within the margin of errors). I do not see how hurricanes can help to explain the accretion of the wetland. Hurricanes may deposit and washout sediments. Did you see the white marl layers in soil columns all over the place as the feldspar marker layer did in the experiments?

Peat Microtopography….

It seems to me that hydrodynamics (water flow) and vegetation may interact to create the pattern (parallel to the stream) of Fig. 6-10. Did you measure flow rates of the experimental areas? The patternlessness of Fig. 11 might be caused by the slower flow rate.

Decomposition

What is a En ratio? What is EICQ?

How do En ratio and EICO relate to net decomposition?

The title of Fig. 6-13 may be in error. Those are not the P enriched sites.

The interpretation of this section is quite confusion or not clear.

Vegetation

The statement of the last sentence in 6-39 is contradictory to what the data said (P has effect on at least one species).

How do the biomass of E. celluosa and R. tracyi compare to those of sawgrass and cattail? This information may be important to predict the peat accretion changes over plant succession.

6-45, Is there any seed bank problem found in the changeover of obligated and facultative species?

Tree Island Ecology

6-46, The figure legend of Fig. 6-19 is not right.
There is no figure for tree growth data.

It seems to me that litterfall is a function of seasonal temperature. Is it true?

Can tree species indicate water regime of a wetland?

Remote sensing and Modeling Trends

Can aerial photographs and satellite images differentiate tree species in Fig. 6-21?

What are the resolutions of X, Y and Z of the LIDAR images?

If the resolution of Z is not good enough, how do you overcome the shortcoming?

Posted on the SFWMD WebBoard September 10, 2002 11:54 AM

Chapter 1 Review by Jeff Jordan

Chapter 1 provides a useful guide to the governmental, scientific, and legal context of the 2003 report, as well as a good discussion of the Everglades resource. Of particular usefulness is the discussion of the opportunities and obstacles in Everglades restoration.

The chapter does a good job of laying out the three main areas of concern in the rest of the Report:

1. The reduction of Phosphorus loadings to the EPA;

2. The challenges of heavy metal mercury, and;

3. The alterations in the hydropatterns of the ecosystem and the hydrological needs of the EPA.

The chapter also highlights the ways the District and its partners are addressing the control of non-point phosphorus inputs to the EPA through BMP's, STA's and ATT's.

The chapter would benefit from a similar discussion regarding mercury and hydrology.

One minor comment: on page 1-12 under Phosphorus Research and Rulemaking, the date December 31, 2001 is used in both paragraphs as the future tense. Is this my design? If so, please explain.

Posted on the SFWMD WebBoard September 12, 2002 11:55 AM
Review by Jeff Jordan

Chapter 8c: Land Acquisition

This chapter describes the land acquisition efforts and strategies used to acquire 21,254 acres of land during WY 2002. The majority of the acquisition are for CERP needs. The report provides an adequate accounting of the land acquisition activities.

Chapter 8d: Fiscal Resources

This chapter fulfills the requirements of the 1999 Everglade Oversight Act regarding fiscal information for the ECP. The chapter describes the revenue sources for all projects. Updated project estimates and cash flows were reported as unavailable, and thus cannot be reviewed. Unfunded mandate estimates were also not provided.

Posted on the SFWMD WebBoard September 18, 2002 11:47 AM
Richard A. Meganck

Cp. 1 "A" INTRODUCTION

Given the increasing level of public interest and scrutiny regarding the Comprehensive Everglades Restoration Plan (CERP), including a 4-part in-depth analysis of the planning and review processes published in the Washington Post in mid-2002 and a series on NPR, this chapter takes on more importance than in previous years. Anyone can question the validity of this type of reporting in terms of providing incomplete information and little data, but the fact remains that more members of civil society will read these types of articles than any formal or scientific report published by any of the participants in the restoration process. If they do have the opportunity to read the consolidated report, members of the public will look to this chapter more than any other for answers to questions raised in the press and by other media outlets.

The Washington Post reported the overall conclusion of their investigation was that "the plan has been shaped by intense political pressures brought by commercial interests." This is certainly not the case or the image of the planning process that the District wants promulgated. However Richard Harvey of the EPA seemed to agree when he stated that the plan was looking more like " 'a massive urban and agricultural water-supply project', an unprecedented federal bailout for a state living beyond its ecological means". Of course, nobody has any idea if Mr. Harvey's comments were taken out of context, but this is what the public reads. Further, the authors noted what for many scientists may be obvious but which the public may misinterpret when they quoting Stuart J. Appelbaum of the Army Corps of Engineers as stating "…we have no idea if this (the CERP process) will work." This type of comment, while true in a technical and scientific sense, does not engender public confidence, particularly when there is constant comment in the media about the billions of dollars that will be spent in this effort. Yes, we are learning while doing, but the general public may not fully grasp that science is a doing by learning process. I believe the public wants answers and solutions. Therefore the District should not miss an opportunity to present the logic of the plan to the public and particularly in the introductory chapter. The District may also want to consider publishing this chapter utilizing some of the excellent graphics from the Washington Post series, as a standalone document in popular outlets to help clarify the details of the plan as well as the orderly and scientific nature of the process to the general public.

That having been stated, I found this chapter to be concise and very well written. The eight-chapter format continues to be logical. This year's draft report is better organized than the 2002 version. In my opinion it will serve as a "stand alone" document for many readers interested in gaining an overview of the area and its principal management issues without having to wade through the technical chapters of the report. The other chapter that may be read by a broad sector of civil society is chapter 7, which presents the CERP. I continue to support the logic of a geographic description, progressing to a more detailed summary of issues as this chapter is organized. I also like the grouping of geographic sub-regions as presented – Everglades Protection Area, Everglades National Park, Florida Bay, and Areas Surrounding the Everglades Protection Area.

Since first included in the 1999 report, the section describing the District and other governmental agencies has been improved. I continue to feel that is it critical to understanding chapters 7 (CERP) and 8 (Other Everglades Programs). The organization of the sub-sections is also logical. Table 1.1 helps clarify a number of issues related to understanding the current status of research

and pilot project investments and should be updated annually. It also helps tie the entire report together with references to specific chapters and their content.

I want to commend the District for taking into account comments made at the 2002 public hearing on the consolidated report and presented in the "Environmental Alteration and Restoration of the EPA" section of the 2003 report. I am particularly encouraged by the inclusion of the sections discussing the "Environmental Challenges to the Everglades" as well as the "The Everglades Restoration Strategy" in the introductory chapter. These two sections in particular will help build both understanding and confidence by the public that the District is making a sincere effort to communicate the complexity of the planning and restoration processes.

As I noted in my comments on the 2002 report, the section entitled "Achieving Long-Term Water Quality Goals" beginning on page 1-12 is very well written. However, I continue to encourage the District to prepare a clearer statement indicating progress to date (trends) in meeting long-term goals, but understand the difficulty of reporting interim research results as if long-term results and implications were already confirmed.

Finally, I would like to note that the summaries provided at the outset of each chapter are very helpful and should continue to be updated as more data is analyzed. Most of the public will read these sections for an orientation to the principal topics addressed in the report.

Chapter 1 Questions (editorial and substantive) R. Meganck

1. Page 1-1, "Areas within the Everglades Protection Area", last sentence, needs clarification that the primary targets of restoration activities are the WCAs, and not the EPA or the Park.

2. Page 1-5, "Florida Bay", para 1, needs a bit of clarification. Is there a way to clarify the relationship between the issue of the die-off of seagrasses in the late 1980s noted in the last sentence and the restoration planning process? Did this single finding actually lead to the beginning to the restoration process? If so, then some clarification as to its importance might be noted at this point.

3. Page 1-9 "Environmental Challenges to the Everglades", para 1. Use of the term "landscape development" could be misleading in my opinion. I suggest either using the term "landscape-scale development" or the term "landscape alteration." I also suggest inserting "land use" in the last sentence, to read "Unfortunately, … changes in spatial extent and land use, hydrology…" Para 2, sentence 3 should be changed from "this century" to "the past century." Para 3. Use of the term "spatial extent" should be clarified. "Spatial extent" of the original ecosystems, from some point in time? The loss of spatial extent implies that spatial extent represents some previous and less altered ecosystem makeup.

4. Page 1-10, the citation from the IWRN Dialogue IV report is not included in the literature cited section.

5. Page 1-12, "Phosphorus Research and Rulemaking" has verb tense errors when referring to work that was to have been completed by 31 December 2001.

Posted on the SFWMD WebBoard September 18, 2002 11:47 AM
Richard A. Meganck

Cp. 5 "A" DEVELOPMENT OF A NUMERIC PHOSPHORUS CRITERION FOR EVERGLADES PROTECTION AREA

I would first like to note the efforts of the District to update this chapter by responding to the comments raised in the public session in 2001. As in previous years, my comments on this chapter are not necessarily of a scientific nature or relating to the methodologies employed in determining P criterion. Rather I will comment on the logic of utilizing specific P levels and the context in which this decision will be applied. I would summarize my comments by asking whether it is necessary to return drinking quality water to a natural system through application of what can be considered a low P limit? The initial costs are high and the ongoing management costs are incalculable at this time. How far up the watershed will this criteria be applied and at what cost?

I have previously questioned the overall water quality goal requiring a numeric P level of 10ppb on a system wide basis for the Everglades region since becoming involved with the review process. I am still confused about the logic, given time and cost restrictions, of trying to restore a very complex and large area to a given point, as driven by TP and then trying to maintain it at that point. Natural systems continue to evolve and are not static. While to some this seems to be a very effective manner in which to judge the success of the restoration effort, it may result in inordinate costs to the District and a number of related environmental risks and management difficulties. It also only provides a snapshot of a given area at a point in time and says little about the long term management of the region.

In my comments on the 2000 and again in 2001 Consolidated Report I noted my reaction to any claim that implies that once a certain plan is implemented a given region or set of natural functions will be "restored" or "protected". I continue to ask restored for whom and for what ends? Natural systems are dynamic with no true climax or static state. And although I realize the legal mandates to comply with measurable end points related to management goals which are undoubtedly achievable, one must complete the equation by clearly stating the risks and costs implied in maintaining any system. In addition the District raises the issue in another manner in this year's report when on page 5-6 in the discussion of the Approach to P-Criterion Development it is noted that "…since other variables can also change along the phosphorus gradients and have the potential of affecting the natural flora and fauna, data collected from the District's experimental dosed mesocosms were used to establish cause and affect relationships between observed biological changes and p enrichment." As these systems are very complex is it legitimate to assume that meeting one criterion implies that the system is in a healthier state?

I still am not convinced that the public understands that the Restudy Bill authorized the District to construct pilot project to help determine the feasibility of technologies included in the comprehensive plan (2001 Everglades Consolidated Report, page 10-1, summary, paragraph 2). I raised the issue last also and was hoping to see this issue addressed in the 2003 draft report. The current report should clearly state that testing these technologies does not imply that they are proven. The District runs the risk of bad press and misunderstanding on the part of the public, environmental risks, and wasting money if assumptions are made based on either incomplete science or unachievable goals. I would consider the numeric P criterion a goal rather than a legally binding definition of success, and recommend using a range of numeric values based on a number of environmental and managerial criteria. Additionally we must remember that a given

technology may be locally feasible, but not viable within a different context or larger region. Some effort should be made to explain this context if only in a footnote.

Chapter 5 Questions – R. Meganck

1. In the public comment period of 2001. The Miccosukee Indian Tribe noted its interest in the reduction in the number of tree islands in the regions. The Tribe is also very concerned about the continued impact on WCA3 by District management decisions that result in higher water levels in the WCA. I did not note any specific reference to these issues in the draft 2003 report.

2. The recommended measurement methodology (page 5-3) notes that the P criterion should be applied so that "it is protective of the natural biological communities present within the EPA without being overly restrictive or below background levels." Is the term "overly restrictive" defined in the text? I could not find it.

3. Last year I raised the issue of the location of the sample points at the discharge point on the Everglades Agriculture Area (EAA). It still seems to me that the text does not adequately address the issue of the logic of establishing various sample points along a transect from the off-farm discharge point through the STAs and the WCAs to the Park. Perhaps I am misunderstanding the research plan, but I believe this may provoke a similar question on the part of the general public.

4. Is it true as the Washington Post series referred to above noted that P levels have increased in some areas immediately south of the sugar plantations? If so, I did not see this reflected in the data presented.

Posted on the SFWMD WebBoard September 18, 2002 11:47 AM
Richard A. Meganck

Cp. 7 "AA" UDATE ON CERP IMPLEMENTATION

Overall this is a highly readable and understandable chapter. The Summary section is excellent. The overall purpose of this chapter is clearly stated in the first two paragraphs. It is also implied that many of the responses to improved timing and distribution of water are not always known. I don't think that the District should shy away from making that point very clear to the public. If we have learned anything about trying to manage natural systems and particularly in trying to restore or somehow reverse the impacts of mismanagement, it is that little is predictable. This is particularly the case when the natural system is being impacted by agriculture and urban development (legally receiving precedence over natural values). The public must also be clear that the positive impacts may take decades to be seen. There is no quick fix in this regard and the District should make that very clear. Finally, noting the role of pilot projects is important to avoid misunderstanding by the public over the long-term implementation of selected technologies.

If the public understand the relationship between the CERP and the many individual activities aimed at improving water quality and habitat, this chapter will become key to their understanding and acceptance of this restoration effort. The general public will judge the effectiveness of expending so many millions of dollars on how well the comprehensive restoration plan is perceived, based in large part upon the RECOVER protocols. Together these protocols may set a new standard for preparing a comprehensive strategy and for ensuring a high degree of compliance with broad restoration goals (with ranges of criteria) in a general sense, but the details for making that assessment are not presented. I am very encouraged to note the statement on page 7A-3 referring to the new programs that must be developed to support the restoration effort.

I commend the District for taking the initiative to develop a comprehensive restoration program, rather than simply implement a series of independent activities. This is the first time that such an effort has been attempted on a scale (landscape/regional) of this size and complexity. I believe that while every effort will be made to be as scientific as possible, several aspects of this program will be somewhat subjective for many years. I would still recommend that a flow chart indicating the relationship of the various monitoring and evaluation programs to the overall goals of the CERP be included in the report. I also support the project-level activities as proposed. The Project Development Team (PDT) is logical but should involved some outside review process to ensure that all technical aspects can be evaluated by the team proposed. The Project Management Plan (PMP) is essential for monitoring activities as implementation proceeds. The Project Implementation Report (PIR) is equivalent to a pre-feasibility level study and the Design Documentation Report (DDR) is to be completed at the feasibility level.

The methodology of pilot projects, feasibility studies and project implementation reports represent a logical strategy to test the effectiveness of technologies for broader application in the future. The six pilot projects seem to cover a variety of technologies and geographic areas. The logic of undertaking a regional-scale hydrological analysis should be strongly supported as it will offer an updated baseline to measure effectiveness at some scale of either individual or program-wide projects. However, indicators used to judge either science or management success of the pilot projects are not adequately discussed. The Washington Post series on the Everglades specifically address several points of the CERP by asking about the viability of the technologies being tested. I think the District may want to make a very clear statement as to the reality of testing technologies including the cost implications.

The framework for presenting the status of Program, Project and Pilot Project activities is excellent and very clear. I also feel the summary of the sic feasibility studies authorized to date is very clear. This presentation format (text and maps) should be maintained and updated each year.

The Restoration, Coordination and Verification section detailed in the 2002 report are not mentioned in this year's report.

Chapter 7 Questions – R. Meganck

1. The 2003 Draft Report contains the statement (page 7A-2) in the History section "The degradation of the South Florida ecosystem must stop. It must be restored, preserved and protected." I believe that this statement raises many questions for which we do not yet have answers. First the "degradation" statement should be attributed to a decision of the legislature or some elected body. I do not think it in the District's interest to make such a statement. In addition, the term "preserved" statement will most certainly attract the attention of urban planners as it is my understanding that domestic use has priority over all other uses. Finally the term "restored" is misleading as it implies that the District can take certain management decisions and return natural systems to a prior state. This is speculative at best and certainly will lead to misunderstanding on the part of the public.

2. Is the monitoring process proposed in the 2002 Consolidated Report still a part of the planning process? If it is, it was not clear if the Academy will be evaluating the various projects and process such as the PMP, PIR and DDR, as part of the overall CERP. In addition, if the Academy is to evaluate the plan in September, indicators or other measures of success must have already been developed. Yet they are not presented in this chapter.

3. Given that financial information will not be available until after the public hearing process is completed, I would like to have the opportunity to at least comment on this information once it becomes available.

4. Why are PMPs and PIRs not required for "critical projects". It is not clear to me and should be explained in the document.

5. The concept of an annual CERP "report card" presented last year was an innovative one that overtime would provide a timetable of the RECOVER program effectiveness and adaptations. I do not know what happened to this concept.

6. How secure is the funding for all of the projects planned as part of the CERP? Is the District prepared to keep the public fully informed as to the consequences should funding be reduced or stopped for any reason?

7. The National Academy of Sciences recently reported that the CERP might negatively impact water quality in the Florida Bay, at least from the public's point of view. The Academy called for more research into the relationships between CERP activities and the Bay. What is the District's response to reports such as this, particularly once such information has been published?

Posted on the SFWMD WebBoard September 18, 2002 11:47 AM
Richard A. Meganck

Cp. 8A "A" ACHIEVING LONG-TERM WATER QUALITY GOALS

The summary section is very well written although I would consider adding a couple of caveats noting that maintaining water quality is an inexact management science.

The strategies noted on page 8A-2 for improving water quality have been discussed in prior years. The methodology for the basin-specific feasibility studies is appropriate to the complexity and scale of the proposed plans. Most restoration plans undertaken to date in the U.S. have measured the impacts of one or two management parameters rather than the combination of BMPs, STAs, and ATTs proposed by the District. It is not clear to me how the District will actually decide what combination of management strategies is best at the basin level given that so many outside influencing factors will continue to require adaptations in order to be able to maintain water quality. The results of these field tests are very important for other wetland management programs in the hemisphere. The Everglades-Pantanal (S. Brazil, N. Bolivia) initiative being sponsored by the Inter-American Water Resource Network (IWRN), the Brazilian Secretariat for Water Resources (SRH) the Brazilian Water Authority (ANA) and the Latin American and Caribbean Center for Water Management in the Humid Tropics (CATHALAC) is following the CERP process closely. Responsible officials will undoubtedly adapt strategies that prove successful in the planning process recently initiated in the Everglades for that region in South America.

The discussion on challenges to achieving long-term water quality goals on page 8A-9 is very relevant to understanding the risks associated with expending public funds based on somewhat limited field testing.

Chapter 8A Questions – R. Meganck

1. One question which I raised last year has not been adequately addressed in this year's draft report. Has it been clearly and legally determined that the mandate to achieve the 31/XII/2006 deadline for achieving full compliance with state water quality standards poses less risk to the overall CERP? In other words, might it not be better to ask for an extension to the 2006 deadline even at the risk of a negative public reaction, if by 31/XII/2003 or 2004 it can be demonstrated that full compliance with water quality standards is not likely.

2. Has a contingency public education plan been discussed in the event that by 31/XII/2003 or 2004 it becomes apparent that full compliance with State water quality standards cannot be met? Is it even legally possible for the District to be declared to be in non-compliance?

Posted on the SFWMD WebBoard September 18, 2002 11:47 AM
Richard A. Meganck

Cp. 8B "A" THE EVERGLADES STORMWATER PROGRAM (ESP)

The goals of the non-Everglades Construction Project (ECP) permit schedules and strategies as stated in the summary and introduction sections to this chapter are clearly stated. I note with particular interest the mention that public outreach efforts have been expanded to address certain issues of interest to the general public. Figure 8B-1 presents important information on the extent of the Everglades Protected Area (EPA) as well as a wealth of information on discharge/water quality data collection points that I have always felt need to be better communicated to the general public.

The section of the report dealing with the status of progress of implementing the ESP beginning on page 8B-4 is very well written and presented in a logical manner.

I continue to believe that the potential weaknesses as well as future problems associated with not meeting the 2006 deadline for P levels should be included in public outreach efforts. I also feel that an effort to communicate the integrated nature of the actions being undertaken should be included in public education materials.

Chapter 8B Questions – R. Meganck

1. Is there any way to combine some of the reporting requirements noted in table 8B-2?

2. It is not clear how the activities contemplated under CERP will impact those that will be completed as part of the ESP. Is there anyway to clarify these relationships in the text of the document?

3. Last year I asked about the result that "more than 75 percent of the data collected at the upstream VOW/ACME monitoring sites were below 95 ppb…" It is still not clear to me if this represent a downward trend since STAs were installed?

Posted on the SFWMD WebBoard September 18, 2002 11:47 AM
Richard A. Meganck

Cp. 8F "A" THE LOWER EAST COAST REGIONAL WATER SUPPLY PLAN

The section of the report dealing with water for the environment is a welcomed addition to the report and clarifies the issue of assignment of water to enhance natural systems rather than to consumptive uses.

Chapter 8F Questions – R. Meganck

No specific questions on this section of Chapter 8

The Washington Post. 23-26 June 2002.
The Washington Post. 2002. A Rescue Plan, Bold and Uncertain. 23 June, pg.14.
Ibid, pg. 14.

Posted on the SFWMD WebBoard September 23, 2002 09:05 AM
Richard A. Meganck

Cp. 7B "AA" RECOVER Activities

First and foremost, the relationship between RECOVER and CERP is clear. This is very important for the general public as it is to the RECOVER team that they will logically turn when faced with a question or issue that requires further information. I fully support the long-term goal of a total ecological model to evaluate the interactions among the regional models and the upstream and downstream effects of transboundary actions.

Figure 7B-1 and the explanatory text provide a very good basis for public understanding of how the CERP process will be monitored and adapted over time.

The concept of setting interim hydrologic restoration stressor-based performance measures is a good one. Obviously the District cannot wait until all of the hydrologic works are completed before beginning to determine their impact on the system. The targets identified by the Alternative Evaluation Team will logically give an indication if restoration efforts are proceeding in the proper direction. This is a valid goal and one that does not require additional definition, in my opinion, at the outset of this process. Some limited and qualified data is better than no data at all. Adapting the model and redefining measurement points and criteria, as new data becomes available, is the only logical way to proceed.

The institutional implications of the last RECOVER objective "Develop a consensus…" noted in the 2002 Consolidated Report continues to critical to future management of the region and should be given priority from the outset so as to catalyze joint ownership of the program. I fully agree with the assessment on page 7B-6 that it is essential to keep the public informed of the key indicators and the changes to the model as it progresses. In this manner the public will have not only a better grasp of the process and its relation to science, but also have a better chance of understanding any unanticipated results requiring major changes in the indicators or methodology.

The MAP is logically presented and needed. I might suggest a sixth section to the MAP , one identifying potential management implications of the monitoring efforts. The Adaptive Management Program detailed on page 7B-10 is a very important tool which will permit the District to keep the public informed as to tangible progress on the restoration effort. The success of this ambitious inter-institutional effort is apparently based on developing a proactive partnership where no one agency controls decisions. As the results of pilot projects and other field trails and investments (policy or infrastructure) become clearer, adjustments affecting certain programs and agencies will be required. This, in turn, requires true institutional collaboration.

In the 2002 consolidated Report you noted the concept of an annual CERP "report card." I respond favorably to this idea as being "an innovative one that will overtime provide a chronogram of the RECOVER program effectiveness and adaptations." I continue to support this idea.

The milestones noted in Table 7-1 on page 7B-13 seem logical but will need further explanation to ensure that the public understands the reason for these interim goals. For example, why is it important to extend the climatic period of record from 31 to 36 years? Also it may be of interest to note how these milestones realted to the overall monitoring program.

Chapter 7B Questions – R. Meganck

1. What guarantee is there that a Total System Conceptual Model for S. Florida will render data at a scale that can be applied at either the regional or local scales to specific problems or issues?

2. If you will analyze the impact of systemwide stressors doesn't the District run the risk of pitting large interest groups against one another (nature preservation, sugar, urban, Indians, etc)? Or will this total system model be used to identify only the broadest of policy questions and not necessarily propose solutions?

Posted on the SFWMD WebBoard Spetember 30, 2002 11:15 AM

Richard A. Meganck Revised Comments

Questions - Revised based on Public Hearing 24-25 October 2002

Chapter 1: INTRODUCTION

1. A general question exists in terms of water quality standards that are being applied in the planning process. Until the formal decision, are all agencies using the 10ppb criterion for TP as a general goal? If differences exist, how are they being addressed? Perhaps some clarification could be included in chapter 1 that will help the reader understand subsequent chapters.

2. In a similar fashion the protocols for analyzing data should be noted and the method for determining these criteria should be included in chapter 1. As one reads the report, it becomes more difficult to compare the results of one research issue or project with that of another and then understand the implications for management decisions taken.

3. The public hearing process clarified the relationship between the District and the FDEP, "District operates under the general supervisory authority of the FDEP"? I am also curious as to how well the District and the COE interact. My general feeling is that it is not as smooth as with the State agencies, but this issue is not addressed in the report.

4. I support the comment made by the representative from the Everglades National Park on including line numbers in the draft text as a means of facilitating comments from reviewers. In addition, the idea of including all comments and not just those of the panelists on the web site is valid.

Posted on the SFWMD WebBoard September 30, 2002 11:15 AM
Richard A. Meganck

Chapter 5: DEVELOPMENT OF A NUMERIC PHOSPHORUS CRITERION FOR EVERGLADES PROTECTION AREA

1. Is there any relationship between the "reference sites" used in the P criterion studies and the determination of CERP restoration goals (even though the CERP is to be applied at a system-wide scale and the P work is being undertaken in the Everglades Protection Area)?

2. It might be interesting to detail the criteria that were used in trying to identify reference sites in the field. The public meeting noted water quality, background P levels, and gradient. There may be others. Again, those involved in the CERP process may find it interesting.

3. There should be a concerted effort in trying to compatibilize Dr. Richardson's 15.6ppb recommendation and that of 10ppb as recommended by the District. I don't think it is in anyone's best interest to continue to disagree in such a public manner. Both research efforts undoubtedly have valid points and some agreement should be reached. While science must drive the final determination of this number, what would a change from the established 10ppb imply? Would the Everglades Forever Act have to be amended? Would the State Legislature have to approve of any such change? Can the District make this decision and simply inform the State, based on science, that such a change is logical? As I read the EFA requirements, a number between 10ppb and 15.6ppb would comply with this law.

Posted on the SFWMD WEbBoard September 30, 2002 11:15 AM
Richard A Meganck

Chapter 7A: UPDATE ON CERP IMPLEMENTATION

1. The 2003 Draft Report contains the statement (page 7A-2) in the History section "The degradation of the South Florida ecosystem must stop. It must be restored, preserved and protected." I believe that this statement raises many questions for which we do not yet have answers. First the "degradation" statement should not be attributed to the District, as it is value laden. In addition, the term "preserved" will most certainly attract the attention of urban planners and those interested, as it is my understanding that domestic use has priority over all other uses. Finally, the term "restored" is misleading as it implies that the District can take certain management decisions and return natural systems to a prior state. This is speculative at best and certainly will lead to misunderstanding on the part of the public.

2. The critical projects identified in the report were supposedly identified to provide quick responses to immediate problems. What results have been forthcoming from these efforts.

3. On page 7A-3 it is noted that "existing animal and plant populations have adapted to some degree to the altered ecosystem." Are these animal and plant populations ones that will be maintained? If so, won't these areas be further affected by CERP activities and therefore negatively impacted from the point of view of existing wildlife populations? Again, if the determination is made that further change to the adapted system is acceptable, then we should drop the pretense that we are restoring the everglades system to some predetermined historical point and are going to maintain it at that point. Rather, the District should be clear that the overall goal is to make the Everglades more natural by restoring historical hydrology patterns and volumes, but that management cannot restore and maintain any natural system in a static sense.

4. Why are PMPs and PIRs not required for "critical projects". It is not clear to me and should be explained in the document.

5. How secure is the funding for all of the projects planned as part of the CERP? Is the District prepared to keep the public fully informed as to the consequences should funding be reduced or stopped for any reason?

6. The National Academy of Sciences recently reported that the CERP might negatively impact water quality in the Florida Bay, at least from the public's point of view. The Academy called for more research into the relationships between CERP activities and the Bay. What is the District's response to reports such as this, particularly once such information has been published?

7. Based on the comments on chapter 2A by the representatives from the U.S. Fish and Wildlife Service and the National Park Service on the compatibility of their agency mandates (referring to protocols and reporting procedures for managed alkalinity, dissolved oxygen and water quality goals/levels, etc.) with those of CERP, I am concerned as to the cumulative potential impact on the CERP particularly as it relates to the ability of District management to make decisions that will actually render the result desired. This is a very serious issue and one that I had assumed had been negotiated early in the CERP development process. The discussion did not resolve this issue. Simply bringing to the attention of the District that a discrepancy exists in indicators is not solving the problem. Rather I was hoping that the response would touch on the

method for resolving these discrepancies and reporting the results in the triennial review. At a minimum the District should clearly state that applying the results of science is an iterative and incremental process.

Posted on the SFWMD WebBoard September 30, 2002 11:15 AM
Richard A. Meganck

Chapter 7B: Update on RECOVER Activities

1. What guarantee is there that a Total System Conceptual Model for S. Florida will render data at a scale that can be applied at either the regional or local scales to specific problems or issues?

2. If the impact of system-wide stressors is analyzed, doesn't the District run the risk of pitting large interest groups against one another (nature preservation, sugar, urban, Indians, etc)? Or will this total system model be used to identify only the broadest of policy questions and not necessarily propose solutions?

3. Will the "report card" eventually present data at the site level?

4. How will the outcomes of the Basin Studies or the C-111 studies affect the CERP process? Given the fact that these two processes will eventually be occurring simultaneously it seems that sequencing will be very important in terms of garnering the maximum amount of data that will affect both processes.

5. Has any consideration been given to predictions of urban development on the East Coast of Florida?

Posted on the SFWMD WebBoard September 30, 2002 11:15 AM
Richard A. Meganck

Chapter 8A: ACHIEVING LONG-TERM WATER QUALITY GOALS

1. It may be helpful to indicate the process used to prepare the 39 management alternatives for the 13 basins as well as the peer-review process employed.

2. How will the District get from the results of this research to the recommendation stage?

3. The validity of the statistical methods employed should be peer-reviewed if it has not already been done. In addition, at some point, somebody has to evaluate the alternatives presented in terms of the overall CERP process. Coordination with CERP is absolutely necessary, based on both potential cost savings and management needs.

Posted on the SFWMD WebBoard September 30, 2002 11:15 AM
Richard A. Meganck

Chapter 8B: THE EVERGLADES STORMWATER PROGRAM (ESP)

1. It is not clear how the activities contemplated under CERP will impact those that will be completed as part of the ESP. Is there anyway to clarify these relationships in the text of the document?

2. Even though the total water retained by the STAs is approximately 5% of the total water flowing south from the EFAs, has there been any study on either the loss of freshwater water surges and sediment composition on the ecology of the Florida Bay?

Richard A. Meganck
2003 Everglades Consolidated Report

Chapter 8F: THE LOWER EAST COAST REGIONAL WATER SUPPLY PLAN

No specific questions on this section of Chapter 8

Posted on the SFWMD WebBoard September 30, 2002 11:19 PM
Review of Chapter 3: Performance and Optimization of Agricultural Best Management Practices
E. Joseph Middlebrooks

As in past reports, an excellent summary is presented of the best management practices implemented in the EAA basin. It is encouraging that these practices have been very effective in reducing phosphorus mass and concentration emanating from the EAA, but it is unfortunate that similar reductions in phosphorus have not occurred in other contributing areas. With the implementation of similar programs throughout the area, much greater improvement in water quality entering the Everglades would be expected. A summary of TP data from the cities and industries would be helpful. When compared with information from the EAA, this may encourage other groups to participate in the BMP program.

An attempt should be made to explain the significant drop in phosphorus mass being discharged from the EAA. It was suggested last year that a significant part of the decrease in phosphorus mass discharge may be attributable to the decline in the phosphorus fertilizer industry. Has an attempt been made to quantify the reasons for the decline? Apparently, it is not necessary for farmers to add phosphorus annually; therefore, some of the decline in phosphorus discharges from the EAA may be attributable to economic conditions.

Points of clarification asked for by the peer review in the 2001 and 2002 Everglades Consolidate Reports are likely explained in other chapters of this report, but it would be helpful to the reader if the explanations were briefly mentioned in this chapter.

Points from past reviews and additional points of interest follow.
a. Does evidence exist to show whether or not phosphorus from the EAA originates from subsidence and mineralization of organic matter or from application of inorganic fertilizers?
b. Is the biogeochemical relationship between mercury and sulfur to be considered in the BMPs?
c. Are hurricane effects taken into account when computing the annual baseline TP load? If so, what is the impact?
d. Have statistical analyses been performed to determine if the differences in base and BMP years are statistically significant? It is understood that these data are sums for the water year, but when the individual flows are multiplied by the 23-day average TP concentrations to obtain the mass of phosphorus removed, there probably are statistical implications that need an explanation.
e. Are data available, other than rainfall, to assess annual percent variations in load variations? If such data are available, a brief summary would be helpful.
f. More discussion of impacts of other phosphorus contributors would be helpful in interpreting the impact of BMPs.

Specific Comments
General comments for various sections of the chapter are presented in the following paragraphs.

SUMMARY
An excellent summary, but a range of TP concentrations or loadings would be better than the use of "appreciable."

EAA Basin Annual Phosphorus Measurement and Calculations
Have statistical analyses been performed to determine if the differences in base and BMP years are statistically significant? It is understood that these data are sums for the water year, but when the individual flows are multiplied by the 23-day average TP concentrations to obtain the mass of

phosphorus removed, there probably are statistical implications that need an explanation. Obviously, the legal requirements have been satisfied.

EAA PERMIT-LEVEL MONITORING RESULTS
Adding a sentence or two explaining sample processing and calculation procedures would be helpful to the reader.What impact does the use of the average concentration multiplied by the intermittent flow rates have on the projected mass loading?

UPDATE ON EVERGLADES BMP RESEARCH
The update would have been improved by presenting data from the studies. After 10 years of study, there should be many interesting results that could have been summarized in tabular or graphical format. Although much of the particulate phosphorus is in the form of biological growth, is there any indication as to how much of this growth is attached growth and transported due to turbulence or the mass that reproduces in the water body by extracting phosphorus?

FINDINGS AND FUTURE DIRECTIONS
Are future reductions in TP from the EAA to be modified, i.e., a cumulative percent reduction with some maximum reduction at which point further reduction is not expected?

PANEL CONCLUSIONS
1. The BMP program has been very successful in reducing the TP mass and concentrations reaching the Everglades.
2. To improve on the present program, it appears that phosphorus budgets are needed along with reduction of particulate phosphorus from the EAA.
3. Statistical analyses of the TP reduction data are needed.

RECOMENDATIONS
1. Continue the good work, and attempt to involve the communities and rural areas to participate in the BMP program. If restoration of the Everglades is to be achieved, it appears to be essential that all parties participate in the BMP program.
2. Attempt to differentiate between the various contributors to the reductions in phosphorus from the EAA. It appears that economic factors may have had a significant influence on the large decrease in phosphorus discharges from the EAA for the past year.

Posted on the SFWMD WebBoard September 16, 2002 1:49 PM &
September 30, 2002 11:19 AM
Review of Chapter 4C: Advanced Treatment Technologies
E. Joseph Middlebrooks

The ATT investigators are to be commended for collecting and analyzing significant quantities of phosphorus removal and hydraulic data for the various biological and chemical processes evaluated. Inclusion of a summary table and diagrams of the processes this year helps in interpreting the results. Including a brief summary of process results and costs in the summary table would improve the summary. Modeling results are interesting and show how difficult it is to model such a complex ecosystem. The lack of detail in the chapter about the data analyses leaves the reader wanting more information to fully understand the results of the various evaluations. It is realized that space is limited and there are numerous results from numerous experiments that warrant the entire chapter and more, but a sentence or two would materially improve the presentation.

It is encouraging that some of the ATTs can reduce TP to 0.010 mg/L and cost estimates indicate that the costs are competitive with other technologies; however, all the processes are very expensive. The cost estimates to restore the Everglades are astounding, and the addition of all treatment alternative costs (e.g., STAs, SAVs and ATTs) to the summary table will give a better perspective to the public of the magnitude of the recovery process.

In the reports on the ATTs, there is virtually no information on how compatible the treated waters will be with the natural flora and fauna of the Everglades. Toxicity tests with treated waters have generally used non-native species and have been inconclusive (e.g., page 4C-45, 4C-57). Furthermore, they have been performed on single species, and no information is given on potential effects of treated waters on the structure and composition of Everglades' communities. These concerns are especially critical in evaluating the potential use of CTSS technologies to reach a 10 ppb P criterion. For example, on page 4C-60, it is discussed that combined CTSS/SAV discharge from a SAV-dominated wetland results in elevated aluminum and chloride concentrations to receiving waters. It is not discussed whether these elevated levels might result in changes in Everglades flora or fauna, and it is not clear that such potential effects have been examined. What is the realistic likelihood that the green technologies can reach, and sustain, a P criterion of 10 ppb? Are the costs of applying such technologies, economically and ecologically, acceptable?

General Comments
The addition of HRT along with the hydraulic loading rates (HLR) will be helpful in interpreting the results. Without the HRT, it is difficult to determine if flow rates, depths or surface areas were varied to maintain equal loading rates.

Section Comments
Comments and questions for each section of Chapter 4C are presented in the following paragraphs.

INTRODUCTION
To be consistent with other chapters, you may wish to change the title of this section to "SUMMARY." It is a good summary needing just a few additions, i.e., a summary table of cost estimates and general results. Table 4C-2 as a part of the summary is good and would be better if the range of values were shown along with the means.

SUBMERGED AQUATIC VEGETATION (SAV)

SAV RESEARCH ON CONSTRUCTED SYSTEMS

A brief statement about objectives of the experiments would be helpful. Showing the common names of the plants and a picture would be useful to the average reader. Where should the single asterisks in Table 4C-3 be located?

Sediment Characteristics and Accretion
Why were the averages of P mass removal rate and storage higher in the north test cells? Were these differences statistically significant? If so, the level of significance should be shown. Showing the range of values would be helpful. Did the flow rates into the various cells vary between cells? How deep were the cores?

P Removal Performance from Inflow and Outflow Water
A plot of the individual data points used to determine the means shown in Table 4C-5 would be useful. With such wide fluctuations of influent P, it is probably best to not presented the results as means. As a minimum, show the range of values for each of the factors or the standard deviation.

What effect did the HRT have on TP removal?

STA-1W, Cell 4 Sediment Characteristics and Stability
A plot of transects values would be informative. The standard deviation is good to have and it would be nice to report the range of values.

STA-1W, Cell 4 Hydraulic Study
It was good to conduct the dye studies so that the poor hydraulic characteristics of the Cell 4 became evident. The results of the dye studies do not show that the cell behaves more like a CSTR. The results simply show that the system is rife with short-circuiting and perhaps dead space. Using the TIS concept can be misleading in a case where short-circuiting dominates the system. The modifications to the cell simply redirected the flow to other channels. Design of future STAs should not be based on a model of a system with such poor hydraulic characteristics.

STA-1W, Cell 5 SAV Monitoring
With decent hydraulic characteristics, it is very likely that the results would be different.

PROCESS MODEL FOR SUBMERGED AQUATIC VEGETATION (PMSAV)

Background and Objective
The predictive capability of the model may be subject to question because of the lack of hydraulic control when establishing the base data. If the model is to be used to predict the performance of the existing STAs, the model probably will suffice, but to predict the performance of new well designed STAs will likely be inadequate. It would not be overly optimistic to expect a much smaller STA than the current size units with good hydraulic characteristics to match or exceed the performance of the larger units.

Short-circuiting can be modeled, but the model will not predict the effects of a good hydraulic design on other factors such as vegetation, sedimentation, TP removal, etc.

P Cycling Processes
Was an attempt made to include a factor to compensate for the effects that storms and hurricanes would have on the long-term deposits.

PMSAV Limitations
With such poor hydraulic characteristics in the data sets, the hydraulics may be an overriding limitation.

STA-1W, Cell 4 Data Sets
All that the dye studies yielded were that the hydraulic conditions were dismal.

NTC-15 Data Sets
Why were the NTC-15 data picked for modeling? The high TP removals are tied to the high influent TP concentrations. If influent concentrations had been in the range of 100 micrograms per liter, the percent removals probably would have been as high as that observed for NTC-15. Selecting the best results to model may not yield reliable results. The multiple dye tracer studies conducted certainly provided a better model for the hydraulics than that for the STAs.

PMSAV Calibration Results

STA-1W, Cell 4 Hydrologic Model
A figure showing the fits would be helpful.

STA-1W, Cell 4 Hydraulic Model
A figure showing the fits would be helpful. It appears that the poor hydraulic characteristics in

STA-1W, Cell 4 were ignored. If this interpretation is correct, the model is useless. An explanation is needed. It appears that the modelers did not like the results, so they changed the results to fit their perceived answer.

Post-STA Phosphorus Removal
It is difficult to understand how a coefficient of determination of 0.31 can be considered a good fit. A coefficient of determination of 0.31 does not indicate a well-formulated model. Figure 4C-6 does not instill confidence that the model fits the data.

NTC-15 Hydraulic Model
It is very good that adequate dye studies were conducted; however, as mentioned in past reviews, showing the classical dye concentration versus time curve will tell the reader much more than a TIS value. Time of first appearance of dye, median and mean HRT, etc. would be revealing; whereas, a TIS value means very little to most readers.

Post-BMP P Removal
Although the simulated versus measured effluent TP yielded a coefficient of determination 0.67 for the calibration period, the fit appears to be erratic. With good hydrology and hydraulic models, it appears that a better fit would be expected.

SAV STANDARD OF COMPARISON
Full-Scale SAV Conceptual Design

Are the percent bypass assumptions based on bypassing a portion of the flow and blending the effluent from the treatment cell with the bypassed water, or is this an assumption of the efficiency of the hydraulic system? If it is based on the hydraulic characteristics, one should remember that with extensive baffling the ratio of the mean actual HRT to the theoretical HRT time only would be 0.75 to 0.8. Under unrestrained flow, the mean HRT will likely be one-half or less of the theoretical HRT.

RESEARCH ON NATURAL SAV SYSTEMS

The conclusion that caution is recommended when extrapolating the P-removal from natural SAV systems to constructed wetlands is well founded. Excluding all other variables, the depth of the natural systems is 5 to 10 times that of the constructed systems.

SUMMARY
It is true that the north test cells removed approximately 70 percent of the TP, but it is likely that had the other cells had influent TP concentrations of 100 micrograms per liter TP removals some may have matched the north cells.

How was the sensitivity to natural disasters assessed?

PERIPHYTON-BASED STORMWATER TREATMENT AREAS (PSTA)
PSTA FORECAST MODEL
The statement that it is currently assumed that higher performance is likely at higher numbers of TIS is accurate, but does not tell the full story. Studies of constructed wetlands have shown that good hydraulic design is essential. Excessive short-circuiting is obviously a serious flaw in any treatment design. When experiments simulate a CSTR, one would expect a CSTR design to describe the system. There appears to be some confusion as to what the TIS number reveals.
This number with an examination of the plot of the dye exiting the system versus time will reveal a lot, but to simply rely on a TIS number can lead to misinterpretations.

Calibration Results
Is the water depth interfaced with the HLR and the flow rate so that the HRT is considered in the analysis?

What caused the downward spikes in the GPP plot in Figure 4C-11?Sensitivity Analysis

PSTA STANDARD OF COMPARISON ANALYSIS
Methodology
Was the flow rate varied to hold the HLR constant? What was the flow rate? What were the HRTs for phase 1?

Results
Is expecting a 76 % reduction in TP optimistic? Removal appears to be tied to influent concentration; therefore, a constant 76 % reduction in TP appears to be optimistic.
Why do costs increase with an increase in bypass? Again, are we talking about a correction for hydraulic efficiency or a bypassing and blending?

The Level of TP Concentration and Load Reduction Achievable by the Technology

Is it realistic to assume that a TP concentration of 12 micrograms per liter can be achieved?

Compatibility of the Treated Water with the Natural Population of Aquatic Flora and Fauna in the Everglades
In the second paragraph the definition that failure occurs when algal growth is less than that in the control system is illogical when the objective is to reduce P to such a level that it becomes the limiting nutrient. Obviously, as stated, the validity of the test for ATTs should be addressed.

Were studies performed to determine the effect of ATTs effluents on plant growth?

Cost Effectiveness of the Technology
Were any of the PSTA systems capable of consistently producing a TP effluent concentration of 12 micrograms per liter?

Is it realistic to expect 50% reduction in TP when the influent concentration is 25 micrograms per liter? The percent removal appears to be a function of influent concentration, decreasing as influent concentration is lowered.

Table 4C-18. Are there data to indicate the optimum depth of shellrock? The 50- year Present Worth should be Millions of $. Should the total volume of water passing through or around the system be used to calculate the $/1000 gallons?

PSTA FIELD-SCALE PROJECT
This is a good set of experiments! Close to reality, but within manageable limits.

Methodology

Hydrology
Define NGVD.

Results

Hydrology
Were all depths the same? If not, are the HRTs to be used in analyses? Were all surface areas equal? Were the dikes dividing the second cell from the right in Figure 4C-12 taken into account?

It appears that all areas were considered equal. With dikes dividing one of the cells, there is a considerable loss in area.

What does TP mass balance show when based on HRT?

If all depths were not equal, hydraulic head would affect the seepage.

Nutrient Removal Efficiency
Are the mean concentrations from the various cells statistically different?

In Figure 4C-14 what caused the spikes during December? The title may read better if in the last sentence "remaining seven months of the" was inserted between "the and water year."

SUMMARY
On the fourth line, it is stated that seepage may be a significant factor. Is it positive or negative or both depending on the cell?

CHEMICAL TREATMENT/SOLID SEPARATION (CTSS)
Were tests performed to determine the effects of the effluent on plant growth?

Results

Water Quality
In the first paragraph are you referring to a clarifier overflow rate or a weir overflow rate?

Conceptual Design and Costs
Do the 50-year present-worth costs include costs for sludge disposal?

CHEMICAL TREATMENT/SUBMERGED AQUATIC VEGETATION RESEARCH
Objectives
Increasing the size of the experiments is commendable, but it is doubtful that the results will be dramatically different because water treatment operators control the processes by performing tests in small jar test apparatus.

CONCLUSIONS by Peer Review Team
1. The Advanced Treatment Group has collected large quantities of data, and the group is to be commended for their efforts.
2. Considerable refinement of the modeling work remains to be done, but significant progress has been made since the release of the 2002 Report. To further refine the modeling, more controlled experimental data may be needed.
3. It appears that some of the advanced treatment processes can produce an effluent with a TP concentration of 10 micrograms/liter; however, studies of costs reductions and environmental impact of discharging these effluents to the Everglades must continue.
4. It appears that with optimization of the STAs (primarily hydraulic improvements) and other ATTs, it is likely that the existing systems can produce a TP effluent of 10 micrograms/liter prior to discharge to the protected areas.
5. Whether this will be economical, remains to be seen.

RECOMMENDATIONS
1. Potential effects of treated waters on the structure and composition of Everglades' communities must be completed. All tests to date have used single species and non-native species.
2. Hydraulic improvements in the STAs should be expanded to include all of the units. It is recognized that this type construction is expensive, but without these modification, it will be extremely difficult to develop accurate models of the systems.
3. Conduct sampling at intermediate points in the STAs after correcting the hydraulic deficiencies. It is likely that the STAs could be reduced in length and still accomplish the same degree of treatment. With good hydraulic characteristics in STAs of the current size, it is likely that portions of the STAs would reintroduce phosphorus to the water at the lower ends of the systems. Intermediate sampling in other types of treatment systems also is important.
4. If not already accomplished, optimize the treatment systems and attempt to improve the fit of the models.

Posted on the SFWMD WebBoard September 10, 2002 9:50 AM &
September 19, 2002 9:12 AM

Review of Chapter 6:
Hydrologic Needs – Effects of Hydrology on Everglades Protection Area

By E. Joe Middlebrooks

The District personnel are to be commended for collecting and analyzing such an enormous quantity of data collected over such a huge expanse. Most sections of the Chapter do not contain statements as to why the data are being collected. A brief statement at the beginning of the Summary and the Introduction outlining the objectives of the data collection and how the data are to be used would be useful to the reader. As the sections read, one could assume that these are random experiments. An expanded statement similar to the material on pages 6-66 and 6-67 would fill the need.

It is obvious that the natural impacts of the hydrology of the Everglades are pronounced and unpredictable from season to season; however, the study of the hydrology and its impact on the EPA physical structure and wildlife is essential. Has an effort been made to determine the impact of controlling the water depth at more or less a constant as proposed by the Natural Systems Model? With the wide natural fluctuations that have occurred in the past, it would appear that "constant" depth would produce an entirely different ecosystem. It is recognized that modeling of such a variable system is extremely difficult, if not impossible, but if restoration is to be accomplished, a study of this important variable must continue.

The study of tree islands is interesting and further illustrates the complexity of such an immense ecosystem. It appears that the tree islands are in a constant state of flux because of storms, ground water, flow patterns and unknown variables, but at the same time further complicates the task of interpreting the influence of hydrology on the EPA. Has thought been given to this constantly changing environment in the modeling processes?

What impact will the influx of high nutrient concentration groundwater have on the treated surface waters from the STAs or chemical treatment? Will the benefit of the removal of TP to a concentration of 10 micrograms per liter be negated by this influx of nutrients? Are the origins of these nutrients known? What is the magnitude of the groundwater entering the Everglades?

Modeling the Everglades and various components has to be one of the most complex activities undertaken in the modeling field. The need for such models cannot be over emphasized when considering the immense financial resources that will be dedicated to the restoration of the Everglades. Errors in judgment will result in huge wastes of financial, scientific and engineering resources.

Specific Suggestions and Editorial Comments
SUMMARY
A general statement of why the various studies are being conducted would be helpful.

HYDROLOGICAL TRENDS
On page 6-2, first paragraph, first line, the sentence beginning with "The worst site." It would be better to select a word other than "worst." For example, "The greatest water level fluctuations occurred in WCA-2A where water levels went down and back up five separate times during the year."

ECOLOGICAL TRENDS
Why is the number of birds varying so widely?
Tree Islands
Second sentence, what appendix?

REMOTE SENSING AND MODELING TRENDS
Modeling: (2). The use of the word "caused" probably should be "predicted."

INTRODUCTION
As mentioned above, a statement at the beginning indicating the objectives of the experiments and how the data are to be used would be helpful.

HYDROLOGICAL TRENDS
WCA-1
Table 6-1 would be improved by showing the range of weekly values for the long-term and 2002 water-years along with the average values.
WCA-2A
Does a historical plot of the water levels exist, and if so, are the fluctuations similar or vastly different from modern data?
Table 6-2 would be improved by adding ranges of values for both long-tern and water-year 2002.
WCA-3A
See comments about Tables 6-1 and 6-2.

EVERGLADES NATIONAL PARK
Either here or preferably earlier in the chapter a brief description of the NSM would be helpful. Not much, just the premise for the model.
Are historical variation data available? Is this observed variation atypical since starting restoration?
Pages 6-14 and 6-15 are blank. I had no difficulty in interpreting these pages.
Table 6-4. See comments for Tables 6-1 through 6-3.
Salinity Patterns in Florida Bay
It is likely that the R^2 for the relationship between Annual Mean Salinity and Annual Southeastern Everglades Rainfall would be much smaller if the individual values were regressed. See the example in Table 1.

ECOLOGICAL TRENDS
FAUNA
Wading Birds
Was there an increase in the phosphorus and nitrogen concentrations in the water during or after the nesting and hatch? Birds excrete large quantities of nutrients and could have a pronounced effect on the nutrient concentrations in areas where they congregate. Has an effort been made to determine the contribution of N and P to the EPA?

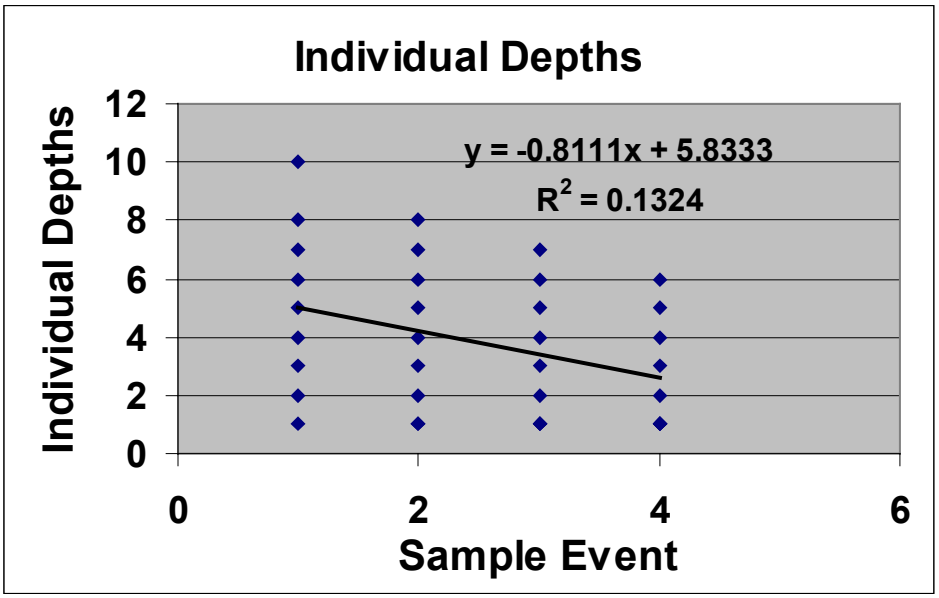
Why is a shift in the timing of wood stork nests to earlier in the breeding season desirable?

Crayfish
Third paragraph. It is doubtful that the high R^2s are valid for the data shown in Figure 6-7. If all data points are regressed, the R^2s will be much less. See Table 1 where the differences in regressing means and individual data points are illustrated. When means are used in the

regression, you will obtain the same equation as that obtained with the individual values, but far different coefficients of determination (R^2).

Table 1. Variation of R^2 When Using Means and Individual Data Points in Regression Analysis.

Sample Event	Individual Depths									Mean
1	10	8	7	6	5	4	3	2	1	5.111111
2	8	7	6	5	4	3	2	1	1	4.111111
3	7	6	5	4	3	2	1	1	1	3.333333
4	6	5	4	3	2	1	1	1	1	2.666667



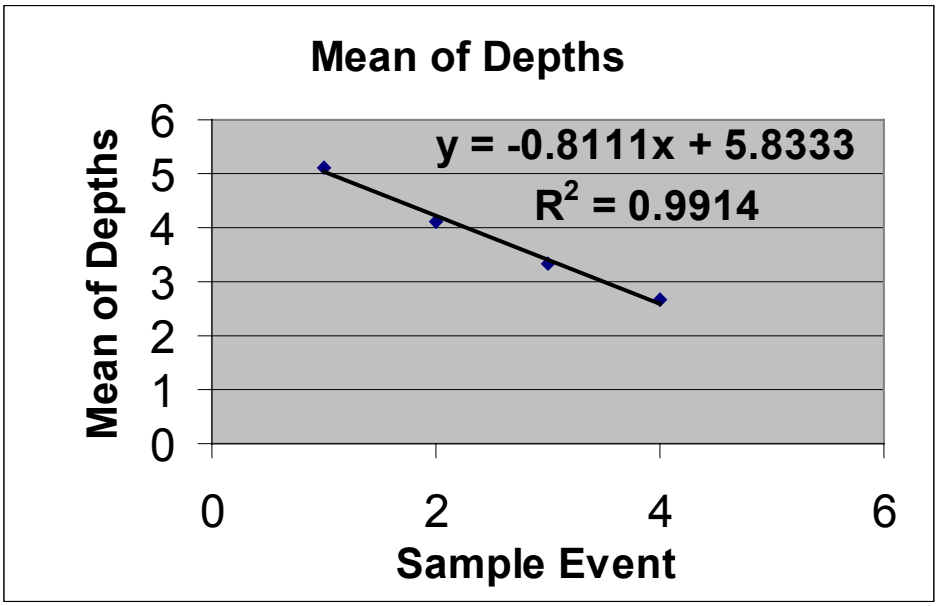


Table 6-6. Are there statistical differences between the means? Data appear too erratic to draw conclusions.

Herpetofauna of Tree Islands
Snakes
Last paragraph, last sentence, not a complete sentence.
Frogs and Toads
Appendix Table 6-6 is missing or I do not know where to locate it.

SOILS AND SEDIMENT
Sedimentation and Erosion Trends
Ninth paragraph, first sentence, "occurred" should read "occurring."

Peat Microtopography and Spatial Pattern in the Ridge and Slough Landscape
Third paragraph, last sentence, "Figs. 1 and 2", probably should read Figures 6-10 and 6-11.
What difference does it make to the EPA if ridges and sloughs are formed and along comes a hurricane or storm and everything is disrupted?
Decomposition
Most reaction rates are influenced by increases in concentration.

VEGETATION
Ridge and Slough
Common names and photographs of the plants would be helpful to the non-scientific reader.
Second paragraph, last sentence, what is the proper title for the Chapter 6 Appendix?
Figure 6-17, a better description of what constitutes a subfigure would be helpful.
Vegetation community changes in Rotenberger
How do you know that a 31-year average stage will lead to a "natural" or "original" condition? What evidence indicates that the NSM truly represents historical conditions?
Second paragraph, fifth line from top of page 6-45, correct punctuation is "wetland species; however, in the past …..".
Second paragraph, adding a few words such as "indicating a return to the original state." at the end of the last sentence, if appropriate, would be helpful.
Table 6-7. What are the values in the parentheses? Are the (No. of leaves) measured over some measured area or what?

Tree Island Ecology
Tree Growth
Figure 6-19. A definition of "Leaves," "Reproductive," "Woody," and "Miscellaneous" would be helpful. Probably know what leaves are, but others need description.
Table 6-8 is missing.
Tree Island Litterfall
How do you compensate for transport of leaves, etc. caused by water movement and rainfall? In other words, what types of controls are available to ensure that effects of wind, water transport, etc. are considered when collecting litterfall?

MANGROVES
Is there any indication of the importance of microtopography relative to the other factors?
How is oxygen taken up by the plants, oxygen to soils and then to usage by plants?
Fourth paragraph, last sentence. Sentence should be specific about which of the sites differed.

REMOTE SENSING AND MODELING TRENDS

REMOTE SENSING

Everglades Tree Island Canopy Measurements Using Lidar and Hyperspectral Data

More discussion of the preliminary results would be interesting assuming that more information is available.

IKONOS Satellite Vegetation Mapping Evaluation

Although the results are preliminary, a discussion of what the various colors and configurations represent would be useful.

Posted on the SFWMD WebBoard September 16, 2002 1:52 PM &
Review of Chapter 8B: The Everglades Stormwater Program
E. Joseph Middlebrooks

Chapter 8B is an excellent summary of the efforts and successes of the ESP. Including summaries of ranges of data and results of monitoring for the various basins would improve the chapter. The tight time frame mentioned in Chapter 8A for implementing the EFA still exists and may make it difficult to fully utilize the information from the scientific and engineering studies.

The changes in regulations providing the District with more flexibility in dealing with stormwater outside the District will help achieve the objective of preserving the Everglades. Completion of the science and engineering and cooperation among the numerous organizations involved in this complex task must occur before imposing arbitrary standards.

The approaches to evaluating and treating stormwater are reasonable, and if the research and coordination effort are completed before an attempt is made to implement control strategies, restoration of the Everglades has an excellent chance; however, success depends upon completion of the studies and a cooperative effort.

The importance of integrating all of the activities designed to recover and protect the Everglades cannot be over emphasized. Cooperation between the various entities and the Legislature is the route to success.

Section Comments

INTRODUCTION
The updated map is very useful and gives a good perspective of the problem facing the entities engaged in protecting the Everglades. Why do the Wellington/Acme Improvement District, Feeder Canal, and L-28 basins not meet standards?

STATUS AND PROGRESS OF IMPLEMENTING THE ELEMENTS OF THE ESP

ESP WATER QUALITY ANALYSIS AND MONITORING PROGRAMS

Where did the Diazinon and chlorpyrifos (ethyl) originate?

Second paragraph, line 3. Why not report the differences rather than using the word "relatively." Line 5, the punctuation should read as follows: "this consolidated report; therefore, the comparison".

Fourth paragraph. Restructuring the sentence as follows would make it clearer. "The ACME1DS and G-94D culverts, operated by VOW/ACME, remain open at all times when upstream pump stations ACME1 or ACME2 are operating and discharging to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge)."
Table 8B-1. Define the superscripts.
Page 8B-6, third paragraph, it may be desirable to briefly define "timed sampling."
Page 8B-6, fourth paragraph, what effect will eliminating the need for these farms to pump west in the A.R.M. Loxahatchee National Wildlife Refuge?
Page 8B-7, lines 2 and 3, why not provide a brief summary of the data shown in Table 3 of Appendices 8B-1b and 8B-1e?

FINANCIAL ASSESSMENTS
Public Outreach Initiatives
Is it feasible to prepare summaries of the referenced documents for inclusion in this chapter? I realize that the documents are readily available, but many readers needing a synopsis will not access the Internet.

Page 8C-11, second paragraph, Are there plans to put this document on the Internet?

PROGRAM MANAGEMENT AND IMPLEMENTATION
UPDATES OF ACTIVITIES IN ESP BASINS
North Springs Improvement District Basin (NSID)
Second paragraph, first sentence, insert comma after "potentially higher." Line 4, a capital "T" is needed at the beginning of the sentence. North New River Canal Basin

Line 5, punctuation needs to read as follows: "'last 18 months; therefore, their agreement."C-11 West Basin

Third paragraph, line 10, define NGVD.L-28 Basin and Feeder Canal Basin
Because of the repetition in these two sections, perhaps it would be possible to combine the two.

Posted on the SFWMD WebBoard September 30, 2002 11:21 AM
Chapter 4C – Advanced Treatment Technologies
Sharitz

In the reports on the ATTs, there is virtually no information on how compatible the treated waters will be with the natural flora and fauna of the Everglades. Toxicity tests with treated waters have generally used non-native species and have been inconclusive (e.g., page 4C-45, 4C-57). Furthermore, they have been performed on single species, and no information is given on potential effects of treated waters on the structure and composition of Everglades' communities. These concerns are especially critical in evaluating the potential use of CTSS technologies to reach a 10 ppb P criterion. For example, on page 4C-60, it is discussed that combined CTSS/SAV discharge from a SAV-dominated wetland results in elevated aluminum and chloride concentrations to receiving waters. It is not discussed whether these elevated levels might result in changes in Everglades flora or fauna, and it is not clear that such potential effects have been examined.

What is the realistic likelihood that the green technologies can reach, and sustain, a P criterion of 10 ppb? Are the costs of applying such technologies, economic and ecological, acceptable?

Posted on the SFWMD WebBoard September 30, 2002 11:21 AM
Chapter 5 Review – Development of a Numeric Phosphorus Criterion for the Everglades Protection Area
Rebecca Sharitz

This is a well-written chapter that summarizes and analyzes data in support of establishing a numeric phosphorus criterion for waters of the Everglades Protection Area. It provides a synopsis of the FDEP's efforts to derive a numeric P criterion and describes proposed P criterion measurement methodology. Analyses of phosphorus data from field transect monitoring, supported by data from dosing studies and information from literature reviews are used by FDEP to make the case for accepting a long-term average annual geometric mean total phosphorus concentration at or below 10 µg/L as "…protective of the natural flora and fauna without being over protective or below background levels." The data used in these analyses have been presented in previous Everglades Consolidated Reports and documents, which this chapter cites appropriately.

The majority of the data used by FDEP in developing the recommended numeric P criterion come from water chemistry measurements in WCA-2A and WCA-1 which have received elevated levels of phosphorus-rich runoff for as long as 40 years. These data were taken over a period of 5 or more years by the SFWMD along transects from non-enriched to enriched sites. Data from reference sites at which the natural biological communities (across trophic levels) exhibit minimal changes in structure and function as a result of P enrichment were used to develop the 10 µg/L criterion, which was then supported by rather limited data along similar gradients from WCA-3 and the ENP. Previous EC Reports have provided biological data supporting the adoption of these reference sites.

The summary of results from WCA-2A and WCA-1, presented in Tables 5-1, 5-2 and 5-3 make a convincing case for that a P criterion of 10 µg/L would be protective of the biota in these systems. The further evaluation given in Figure 5-2, using the 75th percentile, also support this criterion. It is very true, as stated, that the effectiveness of the numeric P criterion in preventing imbalances in the Everglades biological communities will largely depend on how the criterion is applied. The chapter makes a case for the establishment of an upper annual concentration limit of 15 µg/L and for maintaining the 5-year average annual geometric mean at or below 10 µg/L.

The Review Panel believes that body of scientific evidence supports the view that meeting the 10 µg/L P level will be protective of the natural flora and fauna of the Everglades. However scientific evidence does not support the view that this is the only level of P what would be protective of the Everglades biota, nor is there scientific evidence that the 10 µg/L standard is appropriate throughout the entire Everglades Protection Area. The data presented in the Everglades Consolidated Report do not confirm that somewhat higher P levels, ranging perhaps from 11-16 10 µg/L would not be protective of the biota in parts of the Everglades. The Everglades is now, and was in the past, a heterogeneous wetland ecosystem, with spatially and temporally variable water flows, levels, and chemistry. The application of a uniform P criterion across the entire Everglades may not promote patterns of variability that are characteristic of this system.

FDEP has also examined reanalyzed data from dosing studies performed by the Duke University Wetland Center and reported that they are consistent with the 10 µg/L criterion. There is obviously a difference of opinion about whether this is the case, and FDEP and SFWMD scientists are encouraged to meet with DUWC scientists to review the data analyses and work to resolve differences of opinion. It may be necessary to recognize that because of natural

heterogeneity in the Everglades ecosystem, as well as differences in experimental or sampling procedures, there may be differences in responses to levels of P loading.

A serious question remains one what are the reasonable expectations of where and when this P criterion can be achieved and at what costs.

The Summary, in the second paragraph, mentions a three-pronged research agenda consisting of field transect monitoring, field dosing experiments, and laboratory experiments. No further information about laboratory experiments, or data from them, appear to be used in the development of the numeric P criterion, or in supporting the 10 µg/L, appear to be included in the chapter. Were data from such experiments used in this
effort?

In page 5-24, the section labeled Adaptive Management does not describe an adaptive management approach. It only describes a review 10 years after the adoption of the P criterion. Adaptive management would use information gained from the first years of application of the P criterion to inform the management process and make adjustments as needed. It is not clear how this will be carried out.

Posted on the SFWMD WebBoard September 15, 2002 09:01 PM

Chapter 5 Review - Development of a Numeric Phosphorus Criterion for the Everglades Protection Area
Rebecca Sharitz

This is a well-written chapter that summarizes and analyzes data in support of establishing a numeric phosphorus criterion for waters of the Everglades Protection Area. It provides a synopsis of the FDEP's efforts to derive a numeric P criterion and describes proposed P criterion measurement methodology. Analyses of phosphorus data from field transect monitoring, supported by data from dosing studies and information from literature reviews make a convincing case for accepting a long-term average annual geometric mean total phosphorus concentration at or below 10 µg/L as protective of the natural flora and fauna without being over protective or below background levels. The data used in these analyses have been presented in previous Everglades Consolidated Reports and documents, which this chapter cites appropriately.

The majority of the data used in developing the numeric P criterion come from water chemistry measurements along transects in WCA-2A and WCA-1 where P enrichment has occurred, taken over a period of years by the SFWMD. Data from reference sites at which the natural biological communities (across trophic levels) exhibit minimal changes in structure and function as a result of P enrichment were used to develop the 10 µg/L criterion, which was then supported by rather limited data from WCA-3 and the ENP. Previous reports have provided biological data supporting the adoption of these reference sites. The chapter also examines reanalyzed data from dosing studies performed by the Duke University Wetland Center and finds them consistent with the 10 µg/L criterion.

The summary of results from WCA-2A and WCA-1, presented in Tables 5-1, 5-2 and 5-3 appear to make a convincing case for setting a P criterion of 10 µg/L, based on monitoring data from the reference sites. The further evaluation given in Figure 5-2, using the 75^{th} percentile, also give good support to this criterion. It is very true, as stated, that the effectiveness of the numeric P criterion in preventing imbalances in the Everglades biological communities will largely depend on how the criterion is applied. The chapter makes a case for the establishment of an upper annual concentration limit of 15 µg/L and for maintaining the 5-year average annual geometric mean at or below 10 µg/L.

A serious question remains one what are the reasonable expectations of where and when this P criterion can be achieved and at what costs.

Specific questions:
In Figure 5-1, the highest P concentrations in the sediment appear to occur in areas where none of the SFWMD sampling stations are located (well to the west of F1). In checking earlier Everglades Consolidated Reports, I found that sampling stations used by the DUWC scientists occurred in this region, and it appears that the DUWC data may have been combined with the SFWMD data constructing these sediment concentration contours. Is this the case? If so, that should be made clear in the figure legend. It is confusing to show just the SFWMD sampling stations superimposed over these contours. A distance scale on this figure, as well as on Figures 5-4, 5-5, 5-6 and 5-7 would also be useful.

The Summary, in the second paragraph, mentions a three-pronged research agenda consisting of field transect monitoring, field dosing experiments, and laboratory experiments. No further information about laboratory experiments, or data from them, appear to be used in the

development of the numeric P criterion, or in supporting the 10 µg/L, appear to be included in the chapter. Were data from such experiments used in this effort?

In the presentation of the DUWC data on page 5-17, the statement is made that since documentation concerning the details of the reanalysis have not been provided to the FDEP, a thorough evaluation of the DUWC analysis has not been performed. Is it expected that this will be done? For several reasons it would seem important that this happen.

In the locations of the monitoring sites in Figures 5-4 through 5-7 (especially 5-4 and 5-5), it would be useful to know what sites are the same as the ones previously used in developing the P criterion. For example, in Figure 5-4, is CA215 the same location as the U3 reference site? Are CA29, CA27 and CA28 also considered reference sites? Table 5-5 clearly shows that in applying the P criterion, sites E4 and F4 exceed the criterion. So, then the sites closer to the P inputs would exceed the criterion even more severely. Is there a time line or plan for the recovery of these sites? This is covered very briefly in the Recovery Research section, but it would be useful to elaborate on this more here or to reference other sections of this Report if this research is described in more detail elsewhere in the document.

In page 5-24, the section labeled Adaptive Management does not describe an adaptive management approach. It only describes a review 10 years after the adoption of the P criterion. This is very different from true adaptive management. Adaptive management is part of the Comprehensive Everglades Restoration Plan, and is being implemented through the RECOVER process. It would seem that this should be referenced here (and Chapter 7B of the report cited). It would also be appropriate to describe how this process will be carried forward, specifically regarding assessing effects of the application of the P criterion, and in providing recommendations to improve the design and operation of the Plan based on assessments of performance and on new information acquired through research and monitoring.

Editorial:
There is considerable redundancy and repetition, resulting in part from the way in which the chapter is organized. This not so much a criticism as an observation.

P. 5-2, parag. 2, line 1: insert of after analysis
P. 5-7, parag. 2, line 8: omit occur; line 11: insert the after along; line 12: insert the before set
P. 5-10, parag. 2, line 12: shouldn't 1999 be 2000?; line 14, shouldn't 8.0 be 8.2?; parag. 3, line 2: insert the before Refuge
P. 5-11, parag. 1, line 6: shouldn't 1999 be 2000?
P. 5-12, Table 5-2 legend should be move down to immediately above the table (maybe this is a problem with the way I printed out my copy)
P. 5-14, parag. 1, line 1: here and throughout the chapter (e.g., Figure 5-3) it would be good to have consistent use of µg/L rather than ppb.
P. 5-17, parag. 1, line 6: delete to; parag. 2, line 7: shouldn't this be +?; line 11: change ppb to µg/L, delete or and move) to follow µg/L
P. 5-18, parag. 1, line 7: insert by after characterized; line 8: insert of after concentrations; parag. 5, line 2: insert a after was; line 3: insert value after defensible
P. 5-19, parag. 1, line 2: change ppb to µg/L

Posted on the SFWMD WebBoard September 30, 2002 11:21 AM
Chapter 6 Review – Hydrologic Needs – Effects of Hydrology on the EPA
Rebecca Sharitz

This chapter presents a large amount of information, organized into categories of hydrologic trends, ecological trends, and remote sensing and modeling trends. Despite its title, much of the information contained in the chapter addresses hydrologic effects on various aspects of the Everglades ecology, rather than hydrologic needs. The presentation in the peer review workshop used an altered title; "Hydrologic effects on Everglades Structure and Function: Status and Trends," which more accurately reflects the material presented.

The authors are assembling many studies in this chapter. There is a strong need for integration of the research, within the three major themes. Doing this effectively will require substantial editing, including asking some authors to provide more information in the way of discussion about their studies. To the extent that this can be accomplished, the chapter will be much improved. The overall rationale for each major section that the authors propose to add will also help connect and justify the collection of studies that are presented in each section, but more editing to connect the and synthesize the various pieces of research is called for.

As the SFWMD shifts resources toward a hydrologic research program, and as parts of the CERP are implemented, it is critical that efforts be focused on the hydrologic needs of the Everglades. It would be appropriate for the District to direct attention to hydrological temporal and spatial variability so that the importance of variability can be ascertained. This was also recommended in the 2002 Everglades Consolidated Review.

Posted on the SFWMD WebBoard September 30, 2002 11:21 AM
Chapter 7b Review - RECOVER Activities
Rebecca Sharitz

The RECOVER process, developing and implementing an adaptive management program for the CERP, is a critically important part of the overall CERP program, and must be based on a well-designed and well-supported program of monitoring, assessment and research. So far, most of the development efforts appear to have focused on identifying ecological indicators. The chapter gives a good general description of the RECOVER process to date, but leaves open numerous questions that are perhaps beyond the scope of this report. For example, have clear restoration goals and targets been established? Do they recognize possible ecological trade-offs among various elements of the Everglades system? How are exogenous forces in the South Florida region (such as population growth, economic changes, land use changes, sea level rise, etc…) incorporated into the identification of indicators and the establishment of goals?

The CERP Annual Report Card is a useful approach to document and report progress toward recovery of elements of the ecosystem, and for informing the general public. It should not be considered adequate to communicate with decision-makers or various stakeholders, however. It will be important to recognize that some of the variation in the performance measurements may be the result of unexpected influences not related to CERP activities. Thus it would seen critical that monitoring of the indicator elements of the report card include research to establish cause-effect relations between the performance and CERP activities vs. effects of environmental variation or other external influences.

Overall, this chapter provides a good overview of the RECOVER activities.

Posted on the SFWMD WebBoard September 30, 2002 11:21 AM
Chapter 8E Review – Exotic Species in the EPA
Rebecca Sharitz

Invasive species are clearly a major problem in the Everglades, and this chapter is an important part of the Everglades Consolidated Report. It is especially sobering to recognize that South Florida has more introduced animals than any other region in the United States (estimated 26% of mammals, birds, reptiles, amphibians and fish non-native) and yet there has been so little research to understand the extent of the ecological problem or to develop effective controls.

The chapter describes efforts to date, and initiatives of various agencies and organizations in control of exotic invasive species. It clearly states that the major issue is the lack of meaningful information concerning the effect of non-indigenous species in South Florida. Major issues are inadequate funding for scientific investigations to develop effective controls, lack of funding to apply control methods to problem species, and lack of consistency in responses. There is clearly a need for a comprehensive plan that coordinates different agency mandates into a consistent strategy.

The Noxious Exotic Weed Task Team (NEWTT), established in 1999 by the South Florida Ecosystem Restoration Task Force (SFERTF), has been charged with identifying the highest priority invasive plant species for control and developing a comprehensive interagency strategy for their control. A similar effort is desperately needed for invasive animal species. It is encouraging that the Department of Interior has recommended establishment of an exotic animal task team as part of the Comprehensive Everglades Restoration Plan (CERP), and that the SFERTF is establishing the Noxious Exotic Animal Task Team (NEATT). It is to be hoped that the activities of NEATT will be given broad support and funding priorities. As this chapter clearly points out, detailed species-based management plans have been developed for several of the invasive plant species, but there are neither funding or staff to coordinate efforts and control non-indigenous animals in the Everglades Protection Area. In the sections on information Gaps and coordination efforts, it is made very clear that an effort similar to NEWTT is needed to assess the threat of exotic invasive animals and coordinate agency efforts in developing strategies for their control.

Good descriptions of invasive plant management tools are given, along with very complete descriptions of the biology and life history of the seven primary plant species of concern. It is encouraging that The Area-wide Management Evaluation of Melaleuca (TAME Melaleuca) has been established and that this project will demonstrate multiple control tactics to land managers and allow work to be initiated on private lands, defraying the cost of melaleuca control for private landowners. As described at the end of the chapter, one of the major needs is developing incentives for private landowners to control invasive species, which may require expenditure of public monies on private lands or property tax breaks. The need for public education efforts is also clear. An example is the opposition to removal of Australian pine along the Florida coastline where it has crowded out areas of natural vegetation.

Posted on the SFWMD WebBoard September 17, 2002 08:31 AM

Chapter 2A: Status of Water Quality in the Everglades Protection Area

Preliminary Review Comments
Robert C. Ward

Chapter 2A, in the 2003 Everglades Consolidated Report, is again well organized and presented. The 'status' of water quality is defined by compliance of samples with applicable water quality standards for 19 constituents.

Compliance with criteria, rather than standards, continues to be described in the text of Chapter 2A, if not in the title, as it was in the 2002 report. The confusion this generates will not be discussed again this year as it was discussed in the Final Report of the Peer Review Panel Concerning the 2002 Everglades Consolidated Report.

Chapter 2A clearly acknowledges that changes have been made in the way data are analyzed to determine water quality standard compliance. While the effort to introduce a means to quantify risk in making statements about standard excursion rates are to be lauded, the manner in which the change has been made raises concern (i.e. with what appears to be little exploration of the existing literature on the subject). Also, the apparent ease with which changes are made in the data analysis methodology create concern regarding the consistency and comparability of data and information used for management decision making in future years..

Chapter 2A begins by noting that standard violation rate computations are no longer calculated using the 'raw score' approach of previous reports, but rather will be calculated using the binomial hypothesis test. The reasons for this change are to use a methodology "designed to be consistent with other state ambient water programs and U.S. Environmental Protection (USEPA) guidance." (page 2A-2) The references cited to justify what other states and the USEPA are currently employing for excursion analysis are the USEPA (1997), National Research Council (2001) and Smith, et.al. (2001).

The subject of these recommended changes is a major point of discussion in the scientific literature. Griffith et. al. (2001), U.S. Environmental Protection Agency (2002), and numerous texts on environmental statistics and standards (e.g. Gilbert, 1987; and Barnett, V. and A.O'Hagan,1997) present an overview of the many data analysis alternatives, both proposed and in use, to perform standard compliance assessments. It is beyond the scope of this review to delve into the depths of the debate surrounding the use of statistics in standard compliance assessments, but a few overview comments will be provided.

One change described in Chapter 2A, that can be readily confirmed by reading USEPA guidance documents (e.g. U.S. Environmental Protection Agency, 2002), is the more common use of 10 percent rate of excursions from applicable water quality standards to delineate impaired water bodies. Use of the binomial distribution is not recommended within USEPA guidance nor is a statistical method recommended in the National Research Council (2001). To be specific, the National Research Council (2001) states:

"While the committee does not recommend any particular statistical method for analyzing monitoring data and listing waters, the binomial hypothesis test could be required as a minimum and practical first step (Smith et al., 2001)."

With the National Research Council (2001) basing its comment on Smith et al (2001), it is instructive to examine the recommendations of this paper. After discussing several methods for determining standard compliance, Smith et at (2001) make the following statement

"Given the information routinely used in an assessment, the Binomial method should replace the raw score approach."

Smith, et al (2001) describe the raw score approach as the EPA method. Thus, when Chapter 2A indicates a change to the binomial approach, the claim of consistency with USEPA guidance does not seem to be confirmed by a close reading of the two references that were checked. Furthermore, when other references are examined, such as Griffith et al (2001) and the U.S. General Accounting Office (2002), both of which surveyed state monitoring programs, the lack of consistency in methods used to determine standards compliance is further highlighted. Thus, the reasons for the 2003 Everglades Consolidated Report to change methods for computing standards compliance do not appear to be confirmed by current practice. There is need for a much more thorough examination of the use of statistics in water quality data analysis than is contained in the three reference used to justify the changes presented in the 2003 report.

The previous Everglades Consolidated Reports, using the EPA accepted raw score approach, are more inline with current practice. This is not to say the raw score approach should continue to be used, but in terms of a peer review of the changes presented in Chapter 2A to justify change, the reasons provided do not seem to be confirmed by a close examination of the references provided or current practice.

Use of the binomial distribution assumes observations are independent and the probability p of any particular event remains constant for all trails (Sachs, 1978). Are these assumptions valid for the excursion analysis performed in Chapter 2A?

It is not clear how the development of the Impaired Waters Rule, mentioned on page 2A-12, impacts the choice of methods to analyze data in Chapter 2A. Apparently, this 'rule' will define the binomial hypothesis test to delineate impaired waters in Florida. The implication is that the State of Florida will require use of the binomial method, thus the change in methods between the previous Everglade Consolidated Reports and the current draft is done for consistency within Florida, not with other states or the USEPA.

The raw score approach is the most common method employed by states (Griffith, 2001) and is accepted by USEPA. In general, the selection of a method to compute standard compliance is left to the data analyst, resulting in the 'inconsistent' methods employed by state agencies, reported by the General Accounting Office (2002). There is no widely accepted, 'standard' method for computing standard compliance. The need for such a state-of-the-art assessment of methods to compute standard compliance has been suggested by the National Water Quality Monitoring Council, but, at present, the work on the CALM Guidance appears to be the most active effort toward such a goal.

There are many questions regarding the use of hypothesis testing in water quality data analysis that need to be considered when making the changes reported in the 2003 Everglades Consolidated Report. For example, Johnson (1999), while addressing a different environmental application of hypothesis testing, raises a number of critical questions about the method. Two webpages that present considerable literature on the subject (http://www.indiana.edu/~stigtsts/index.html and http://www.niwa.co.nz/rc/prog/stats/issues.pdf) present a number of troubling aspects of using the approach suggested in the 2003 Everglades

Consolidated Report. These aspects do not appear to be evaluated nor addressed prior to use in Chapter 2A. The Swan-Canning Cleanup Program, in establishing its binomial approach to criteria development (http://www.wrc.wa.gov.au/srt/publications/SCCP_Oct2001.pdf), provides considerable more discussion of the issues surrounding the science than is provided in the Chapter 2A.

The Process of Changing Data Analysis Methods

The issues raised by the change in data analysis methods in Chapter 2A require further comment. In Chapter 2A, the methods used to obtain data follow strict protocols (e.g. SFWMD Quality Assurance manual and Standard Operating Procedures), but the methods to analyze the data do not appear to be documented in protocols outside Chapter 2A. Is this the case? If so, why are data collection and laboratory methods documented and strictly followed, while the methods for analyzing the data are not documented outside Chapter 2A? Also, it is noted that the SFWMD Quality Assurance manual and Standard Operating Procedures are 'reviewed and updated annually'. Is the annual review of Chapter 2A by he Peer Review Panel the only external review of the data analysis methods employed in Chapter 2A?

If, in fact, there is no carefully documented data analysis protocol to follow in computing standard compliance, did the change in authorship between the 2002 and 2003 reports influence the choice of data analysis methods? Will another change in authors result in another change of methods at some later date? The issue being raised with such questions relates to whether the acquisition of information regarding standard compliance is viewed as a 'research' activity or a 'monitoring' activity. There is a tension in the field of water quality monitoring between those who feel sound science forces the data analyst to retain the right to use any data analysis method that can be supported by the data, i.e. 'research' compliance with standards. The determination of standard compliance, from this perspective, requires the analyst to explore available data, using the most current data analysis methods, to extract information.

On the other hand, there are those who feel that achieving consistency and comparability in water quality information over time and space, particularly in support of fair and equitable management decision-making, requires development of a scientifically sound data analysis protocol that is strictly followed in producing water quality information from data, that is to be used to implement fair and equitable management. Monitoring protocols apply to not only sample collection, laboratory analysis, but also to data record preparation and data analysis, IF the information is to serve management purposes.

In the former case, the definition of sound science implies that a 'research' approach is taken to analyzing water quality data. In other words, peer review occurs after the data are analyzed (as is the case with the data analysis employed in the Everglades Consolidated Report for standard compliance). A criticism of this approach is the fact that any other scientist can come forward with a competing data analysis method and challenge the conclusions of the original analyst. Using the 'research' approach to data analysis forces the selection of a data analysis method to occur at the same time the data analysis results are presented. If the results are challenged, the selection of the data analysis method is often the basis for the challenge. Unfortunately, the 'research' approach also tends to produce variable information statements over time, thus confusing managers seeking consistent and comparable information. In some ways, the General Accounting Office (2002) is documenting the inconsistencies created when each analyst is able to choose the methods employed to produce management information. The inconsistencies prevent management from obtaining a comparable picture of management results and consistent evaluation of needed future management actions.

In the 'monitoring' approach, the data analysis methods are selected and peer reviewed, as part of the overall design of the monitoring system in support of management (as they are currently for sampling and laboratory methods). The design is completed and reviewed before the data are collected. The methods are selected based on the need for consistent and comparable information for management decision making and not the 'research' need for freedom of the analyst to select the method. In this case, a data analysis protocol is prepared, using the general statistical behavior of the water quality variables being measured, and is peer reviewed for the science it incorporates in providing management information. Economists, in developing indices and indicators of the behavior of the economy, employ the latter approach, as do those that report weather data and information. This issue is discussed in more detail by Ward (2002).

Another aspect of changing data analysis methods, which is not presented in Chapter 2A, is consideration of alternative methods before selecting a specific method. What evaluation of alternative data analysis methods was performed before a decision was made to employ the binomial method? Were all the assumptions of the competing methods carefully considered relative to impacts on the information presented to management? It appears the recommendations of one paper were followed in selecting a new method. The very rich literature on standard compliance statistics was not explored beyond the one paper.

From a narrow peer review perspective of Chapter 2A, it appears that the new method is employed in a scientifically sound manner, but there is concern that the method is not widely accepted for the use to which it is being put. To be fair, Griffith et al (2001) note that evaluating and reporting of alternative methods of data analysis, before selecting a method to analyze water quality data for management purposes, is rare.

Did the methodology for evaluating pesticide results include the changes employed for the other constituents? It does not appear that they changed. Why is this the case? Is it because of the small sample size? This apparent exception to the new methodology needs more explanation.

Adkins (1993) reviews the use of data analysis protocols in various aspects of society and outlines and illustrates how the concept could be used to enhance the acquisition of water quality information in a transparent and auditable manner, via developing a water quality data analysis protocol.

Sample Size Considerations

On page 2A-12, a problem noted with the raw score approach used in previous Everglade Consolidated Reports is its inability to account for sample size. Yet, in describing application of the new data analysis method, sample size is restricted to a minimum of 20 (page 2A-13). Would a similar sample size restriction make the raw score approach more comparable to the binomial approach? It should be noted that the CALM Guidance document, in Appendix D, suggests a minimum of 28 samples to make a standard compliance determination using the binomial distribution method and concludes that the binomial model is no panacea for inadequate sample size. Thus, it appears that regardless of the data analysis method, employing small sample sizes to assess standard compliance, is a problem.

This is further confirmed by the Water Quality Academic Advisory Committee (1998) which prepared an assessment of methods to measure water quality impairments required by Section 303(d) of the Clean Water Act for the Virginia Department of Environmental Quality (DEQ). The report notes:

"… in the long run the DEQ should increase sampling frequency at its monitoring stations. Increasing sampling frequency, i.e. sample size, would make differences between the methods less important and reduce the chance of making a false decision about impairment."

A follow up report of this committee in 2002 continues to explore the statistical issues surrounding measuring standard compliance and sample size and is an example of the literature developing around this topic.

In Table 2A-2, it appears that for WCA-3, inflow, the excursion analysis was performed with less than 20 samples. Is this the case? The same situation appears to occur in Table 2A-3 for inflow, total silver; interior, total copper and total lead; and rim, total iron.

Data Preparation for Analysis

The discussion of data screening and handling on page 2A-11 raises several questions. The term 'statistical outliers' is mentioned, but no explanation of the use of statistical screening methods is provided. Are the data screened for statistical outliers, even though outliers are not excluded? Was the impact of employing an arithmetic mean to be the one observation for multiple samples, acquired in one day, on the variance of the observation, compared to other single observations, evaluated? Why was ½ the detection limit chosen for summary statistic purposes? How are missing values in the data record handled? Is there concern for a string of missing values in a key season biasing the results?

More generally, are the methods for screening data documented? Are references to support the decisions for preparing data records for statistical analysis provided? Given the changes in data screening this year, how are future changes to data screening methods considered and approved before incorporating them into the results of the report?

Adkins (1993), again, illustrates how such documentation could be assembled into a data analysis protocol.

Monitoring System Design for Standard Compliance Determination

With the changes made in this year's data analysis methods, and the related issue of small sample size, there is a need to revisit a recommendation made by this panel last year.

A stronger scientific foundation could be placed under a water quality standard compliance assessment if it was based on data obtained exclusively for the purpose of measuring standard compliance. Sampling size differences could be eliminated and an equal sample size could be instituted at all sampling stations – for standard compliance purposes only. Last year concern was expressed for the cost of a specialized 'standard compliance' monitoring program, for an area the size of the EPA; however, to obtain the consistency and comparability of monitoring information for fair and equitable management decision making, the issue of developing a monitoring strategy that creates a scientifically sound data record for compliance determination should be revisited. Instead of 'mining' available data for standard compliance assessment and struggling with differences in information created by differences in sample sizes, a subset of the total EPA monitoring program could be used to create a more uniform data record for the specific purpose of standard compliance, using peer reviewed methods through out the water quality information system.

Editorial Comments:
1. Smith et al (2001) reference is missing.
2. Is there a report number for U.S. EPA (1997) or an office that produced the report?
3. On page 2A-24, is there a reason why the hypothesis test reported here does not test WY 2002 with the base period1978-2000? The WY 2002 is tested against the median of 1994-2001. The implication is the test reveals a flow related relationship, but this is not stated directly.
4. On page 2A-12, National Research Council (2001) and NRC (2001) appear to be the same report being cited in the same sentence.

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Posted on the SFWMD WebBoard September 30, 2002 11:25 AM

Chapter 2A: Status of Water Quality in the Everglades Protection Area

Preliminary Review Comments – Round 2
Robert C. Ward

Chapter 2A, in the 2003 Everglades Consolidated Report, is again well organized and presented. The 'status' of water quality is defined by compliance of samples with applicable water quality standards for 19 constituents.

Compliance with criteria, rather than standards, continues to be described in the text of Chapter 2A, if not in the title, as it was in the 2002 report. The confusion this generates will not be discussed again this year as it was discussed in the Final Report of the Peer Review Panel Concerning the 2002 Everglades Consolidated Report.

Chapter 2A clearly acknowledges that changes have been made in the way data are analyzed to determine water quality standard compliance. The data analysis method changes in Chapter 2A, in many ways, reflect maturation of water quality monitoring as the Everglades restoration program moves from a strong research orientation toward a more long-term management focus. While the effort to introduce a means to quantify risk in making statements about standard excursion rates are to be lauded, the manner in which the change has been made raises concern (i.e. with what appears to be little exploration of the existing literature on the subject). This concern is discussed below.

It must be pointed out that the science behind standard compliance determination is not well defined (i.e. there are no widely agreed upon methods). There are many alternative methods available to analyze data to determine standard compliance and there is a lively debate underway on which method is 'best'. Different authors and groups advocate, promote or suggest specific methods for standard compliance determination. In choosing a method for the Everglades water quality management program, the science behind the debate surrounding that method should be summarized with an explanation of why a specific method was chosen over the many others available.

When a new method is used in preparation of Chapter 2A, is this method also being used in other standard compliance calculations, e.g. BMP and STA performance measurement, within the Everglades restoration program? Was the change in Chapter 2A agreed to by authors of other chapters? If not, how will the difference in standard compliance computations be acknowledged in the report?

The apparent ease with which changes are made in the data analysis methodology create concern regarding the consistency and comparability of data and information used for management decision making in future years.

Chapter 2A begins by noting that standard violation rates computations are no longer calculated using the 'raw score' approach of previous reports, but rather will be calculated using the binomial hypothesis test. The reasons for this change are to use a methodology "designed to be consistent with other state ambient water programs and U.S. Environmental Protection (USEPA) guidance." (page 2A-2) The references, cited to justify what other states and the USEPA are currently employing for excursion analysis, are the USEPA (1997), National Research Council (2001) and Smith, et.al. (2001).

As noted above, the subject of these recommended changes is a major point of discussion in the scientific literature. Griffith et. al. (2001), U.S. Environmental Protection Agency (2002), and numerous texts on environmental statistics and standards (e.g. Gilbert, 1987; and Barnett, V. and A. O'Hagan, 1997) present an overview of the many data analysis alternatives, both proposed and in use, to perform standard compliance assessments. It is beyond the scope of this review to delve into the depths of the debate surrounding the use of statistics in standard compliance assessments, but a few overview comments will be provided.

One change described in Chapter 2A, that can be readily confirmed by reading USEPA guidance documents (e.g. U.S. Environmental Protection Agency, 2002), is the more common use of 10 percent rate of excursions from applicable water quality standards to delineate impaired water bodies. Use of the binomial distribution is not recommended within USEPA guidance nor is a statistical method recommended in the National Research Council (2001). To be specific, the National Research Council (2001) states:

"While the committee does not recommend any particular statistical method for analyzing monitoring data and listing waters, the binomial hypothesis test could be required as a minimum and practical first step (Smith et al., 2001)."

Smith et.al (2001), after discussing several methods, make the following statement

"Given the information routinely used in an assessment, the Binomial method should replace the raw score approach."

Smith, et.al. (2001) describe the raw score approach as the EPA method. Thus, when Chapter 2A indicates a change to the binomial approach, the claim of consistency with USEPA guidance does not seem to be confirmed by a close reading of the two references that were checked. Furthermore, when other references are examined, such as Griffith et al (2001) and the U.S. General Accounting Office (2002), both of which surveyed state monitoring programs, the lack of consistency in methods used to determine standards compliance is further highlighted. Thus, the reasons for the 2003 Everglades Consolidated Report to change methods for computing standards compliance do not appear to be confirmed by current practice. The previous Everglades Consolidated Reports, using the EPA accepted raw score approach, are more inline with current practice. This is not to say the raw score approach should continue to be used, but in terms of a peer review of the changes, the reasons provided for the change do not seem to be confirmed by a close examination of current practice.

Use of the binomial distribution assumes observations are independent and the probability p of any particular event remains constant for all trails (Sachs, 1978). Are these assumptions valid for the excursion analysis performed in Chapter 2A? How will differences in the number of samples at each sampling site affect the comparability of conclusions regarding standard compliance? In forming the hypothesis, was a comparison made between testing for compliance and testing for violation (was consideration given to characterizing the burden of proof?).

It is not clear how the development of the Impaired Waters Rule, mentioned on page 2A-12, impacts the choice of methods to analyze data in Chapter 2A. Apparently, this 'rule' will define the binomial hypothesis test to delineate impaired waters in Florida. The implication is that the State of Florida will require use of the binomial method, thus the change in methods between the previous Everglade Consolidated Reports and the current draft is done for consistency within Florida, not with other states or the USEPA.

The raw score approach is the most common method employed by states (Griffith, 2001) and is accepted by USEPA. In general, the selection of a method to compute standard compliance is left to the data analyst, resulting in the 'inconsistent' methods employed by state agencies, reported by the General Accounting Office (2002). The need for a state-of-the-art, widely agreed upon, assessment of methods to compute standard compliance has been suggested by the National Water Quality Monitoring Council, but, at present, the work on the U.S. EPA's CALM Guidance appears to be the most active effort toward such a goal.

The Process of Changing Data Analysis Methods

The issues raised by the change in data analysis methods in Chapter 2A require further comment. In Chapter 2A, the methods used to obtain data follow strict protocols (e.g. SFWMD Quality Assurance manual and Standard Operating Procedures), but the methods to analyze the data do not appear to be documented in protocols outside Chapter 2A. Is this the case? If so, why are data collection and laboratory methods documented and strictly followed, while the methods for analyzing the data are not documented outside Chapter 2A? Also, it is noted that the SFWMD Quality Assurance manual and Standard Operating Procedures are 'reviewed and updated annually'. Is the annual review of Chapter 2A by the Peer Review Panel the only external review of the data analysis methods employed in Chapter 2A?

If, in fact, there is no carefully documented data analysis protocol to follow in computing standard compliance, did the change in authorship between the 2002 and 2003 Chapter 2A influence the choice of data analysis methods? Will another change in authorship result in another change at some later date? The issue being raised with such questions relates to whether the acquisition of information regarding standard compliance is viewed as a 'research' activity or a 'monitoring' activity producing consistent and comparable data and information.

There is a tension in the field of water quality monitoring between those who feel sound science forces the data analyst to retain the right to use any data analysis method that can be supported by the data. The determination of standard compliance, from this perspective, requires the analyst to explore available data, using the most current data analysis methods, to extract information.

On the other hand, there are those who feel that achieving consistency and comparability in water quality information over time and space, particularly in support of fair and equitable management decision making, requires development of a scientifically sound data analysis protocol that is strictly followed in producing water quality information from data. Monitoring protocols apply to not only sample collection, laboratory analysis, but also to data record preparation and data analysis.

In the former case, the definition of sound science implies that a 'research' approach is taken to analyzing water quality data. In other words, peer review occurs after the data are analyzed (as is the case with the data analysis employed in the Everglades Consolidated Report for standard compliance). A criticism of this approach is the fact that any other scientist can come forward with a competing data analysis method and challenge the conclusions of the original analyst. Using the 'research' approach to data analysis forces the selection of a data analysis method to occur at the same time the data analysis results are presented. If the results are challenged, the selection of the data analysis method is often the basis for the challenge. Unfortunately, the 'research' approach also tends to produce variable information statements over time, thus confusing managers seeking consistent and comparable information. In some ways, the General Accounting Office (2002) is documenting the inconsistencies created when each analyst is able to

choose the methods employed to produce management information. The inconsistencies prevent management from obtaining a comparable picture of management results and consistent evaluation of needed future management actions.

In the 'monitoring' approach, the data analysis methods are selected and peer reviewed, as part of the overall design of the monitoring system in support of management. The design is completed and reviewed before the data are collected. The methods are selected based on the need for consistent and comparable information for management decision making and not the 'research' need for freedom of the analyst to select the method. In this case, a data analysis protocol is prepared, using the general statistical behavior of the water quality variables being measured, and is peer reviewed for the science it incorporates in providing management information. Economists, in developing indices and indicators of the behavior of the economy, employ the latter approach, as do those that report weather data and information. This issue is discussed in more detail by Ward (2002).

From a narrow peer review perspective of Chapter 2A, it appears that the new method is employed in a scientifically sound manner, but there is concern that the method is not widely accepted for the use to which it is being put. To be fair, Griffith et al (2001) note that evaluating and reporting of alternative methods of data analysis, before selecting a method to analyze water quality data for management purposes, is rare.

Did the methodology for evaluating pesticide results include the changes for the other constituents? It does not appear that they changed. Why is this the case? Is it because of the small sample size? This apparent exception to the new methodology needs more explanation.

The minimum number of samples for beryllium was not available to support the new standard compliance methodology for this water quality constituent, but determination of standard compliance was made anyway. Should the calculations be expanded to include this situation? This same situation appears to occur in Table 2A-2, where, for the WCA-3 inflow, the excursion analysis was performed with less than 20 samples. Is this the case? The same situation appears to occur in Table 2A-3 for inflow, total silver; interior, total copper and total lead; and rim, total iron.

Adkins (1993) reviews the use of data analysis protocols in various aspects of society and outlines and illustrates how the concept could be used to enhance the acquisition of water quality information in a transparent and auditable manner.

Sample Size Considerations

On page 2A-12, a problem noted with the raw score approach used in previous Everglade Consolidated Reports is its inability to account for sample size. Yet, in describing application of the new data analysis method, sample size is restricted to a minimum of 20 (page 2A-13). Would a similar sample size restriction make the raw score approach more comparable to the binomial approach? It should be noted that the CALM Guidance document, in Appendix D, suggests a minimum of 28 samples to make a standard compliance determination using the binomial distribution method and concludes that the binomial model is no panacea for inadequate sample size. Thus, it appears that regardless of the data analysis method, employing small sample sizes to assess standard compliance, is a problem.

This is further confirmed by the Water Quality Academic Advisory Committee (1998) which prepared an assessment of methods to measure water quality impairments required by Section 303(d) of the Clean Water Act for the Virginia Department of Environmental Quality (DEQ). The report notes:

"… in the long run the DEQ should increase sampling frequency at its monitoring stations. Increasing sampling frequency, i.e. sample size, would make differences between the methods less important and reduce the chance of making a false decision about impairment."

A follow up report of the Virginia committee in 2002 continues to explore the statistical issues surrounding measuring standard compliance and sample size and is an example of the literature developing around this topic.

Data Preparation for Analysis

The discussion of data screening and handling on page 2A-11 raises several questions. The term 'statistical outliers' is mentioned, but no explanation of the use of statistical screening methods is provided. Are the data screened for statistical outliers, even though outliers are not excluded? Was the impact of employing an arithmetic mean to be the one observation for multiple samples, acquired in one day, on the variance of the observation, compared to other single observations, evaluated? Why was ½ the detection limit chosen for summary statistics purposes? How are missing values in the data record handled? Is there concern for a string of missing values in a key season biasing the results?

More generally, are the methods for screening data documented? Are references to support the decisions for preparing data records for statistical analysis provided? Given the changes in data screening this year, how are future changes to data screening methods considered and approved before incorporating them into the results of the report?

Adkins (1993), again, illustrates how such documentation could be assembled into a data analysis protocol.

Monitoring System Design for Standard Compliance Determination

With the changes made in this year's data analysis methods, and the related issue of small sample size, there is a need to revisit a recommendation made by this panel last year.

A stronger scientific foundation could be placed under a water quality standard compliance assessment if it was based on data obtained exclusively for the purpose of measuring standard compliance. Sampling size differences could be eliminated and a minimum sample size could be instituted. Last year concern was expressed for the cost of a specialized 'standard compliance' monitoring program, for an area the size of the EPA. However, to obtain the consistency and comparability of monitoring information for fair and equitable management decision making, the issue of developing a monitoring strategy that creates a scientifically sound data record for compliance determination should be revisited. Instead of 'mining' data for standard compliance assessment and struggling with differences in information created by differences in sample sizes, a subset of the total EPA monitoring program could be used to create a more uniform data record for the specific purpose of standard compliance, using peer reviewed methods through out the water quality information system and across Everglades restoration programs.

Editorial Comments:
1. Smith et al (2001) reference is missing.
2. Is there a report number for U.S. EPA (1997) or an office that produced the report?
3. On page 2A-24, is there a reason why the hypothesis test reported here does not test WY 2002 with the base period1978-2000? The WY 2002 is tested against the median of 1994-2001. The implication is the test reveals a flow related relationship, but this is not stated directly.
4. On page 2A-12, National Research Council (2001) and NRC (2001) appear to be the same report being cited in the same sentence.

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Note from R. Sharitz: Robert Ward sent me this review on Sept. 15. I didn't realize that he probably expected me to post it to the WebBoard. I apologize for the delay.

Posted on the SFWMD WebBoard September 20, 2002 4:06 PM
Chapter 5: Development of a Numeric Phosphorus Criterion for the Everglades Protection Area
Preliminary Review Comments
Robert C. Ward

Phosphorus Measurement Methodology Comments

Pages 5-23 and 5-24 describe and justify a proposed P 'criterion' measurement methodology. Included in the methodology is information about how the data will be prepared for statistical analysis and how the legally required computations will be interpreted to reach conclusions regarding compliance with the new phosphorous standards. Providing detail on the methods by which compliance will be measured and quantified is critical to producing consistent and comparable information to support future management decision making. The following questions arise in reviewing the methodology.

Why is the subtitle referring to phosphorus 'criterion' measurement monitoring? Is not a phosphorus standard being established for the EPA, using the criterion developed by the FDEP? Or is the word 'criterion' used in the law, thus, forcing its use in this chapter? An explanation of the use of 'criterion' may help readers not familiar with the word 'criterion' used in the context presented.

What methods, statistical or otherwise, will be used to 'optimize' the current monitoring network to provide 'adequate' spatial coverage? How is 'optimize' defined in this context (i.e. what is the objective function for the optimization process)? How will 'adequate' spatial coverage be defined and quantified?

The sampling frequency discussion on page 5-23 is confusing. What does 'six monthly samples' mean? Is it expected that as much as six months each year it will not be possible to obtain valid samples? How does this apparent low sample size mesh with the goal of at least 20 samples required for standard compliance computations described in Chapter 2A? Cross referencing P measurement with methods used for other water quality constituents avoids confusion if the methods are different, and they appear to be in this case.

Are the only reasons that outlier data may be deemed 'not valid' listed at the top of page 5-24? Or is the analyst reserving the right to identify other reasons to declare data to be invalid? If the latter is the case, what stops a stakeholder, displeased with the findings, from requesting other data be declared 'not valid' for reasons they deem sufficient? How will such differences of opinion be resolved in producing widely accepted agreement on P standard compliance in the EPA? The proposed measurement methodology is declared objective and scientifically reliable on page 5-24. Has the methodology been peer reviewed? Or is the judgment based on the example presented in Table 5-5?

On page 5-23, it is noted that a 'District Technical Publication' will be prepared that describes the monitoring network and Standard Operating Procedures to be used to obtain samples form the network. Hopefully, questions like those above will be addressed when more effort is devoted to precisely defining a total phosphorus standard compliance monitoring program, from sample collection through data analysis and interpretation. Once drafted, before it is formerly used to produce a standard compliance assessment, will the publication be peer reviewed?