Appendix 1-4: Final Report of the Peer Review Panel for the *2004 Everglades Consolidated Report*

With the exception of reformatting some information for better readability, the Chapter 1 appendices were not edited or spellchecked by the ECR production staff. They appear as posted on the District's WebBoard.

FINAL

REPORT

Of the Peer Review Panel Concerning the

2004 Everglades Consolidated Report

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INTRODUCTION

The responsibility of this panel was to review and prepare questions on the draft of the *2004 Everglades Consolidated Report* (the Report), dated September 2003. In addition, the panel's responsibilities included the consideration and inclusion of input from the public workshop conducted September 23-25, 2003, where relevant. All comments noted on the WebBoard by October 3, 2003, have been considered in writing this final report. This Report summarizes the panel's findings regarding the key facts presented during the workshop and conclusions and recommendations on the subjects raised by the report authors and public participants.

The Report and this peer review are part of an open panel review and public hearing to ensure that all involved are given an opportunity to be part of an open deliberation before a panel of objective experts.

Constructive criticism of the Everglades programs and projects were sought from the panel. However, this review by its very nature and constraints is not designed to evaluate detailed aspects of research and monitoring. The panel's task was to determine if the appropriate scientific models and applications were employed, if all relevant data were used, and if the Report's findings were a logical consequence of the science and the data.

In reviewing the Draft Report, the general questions that the panel addressed included:

1. Does the draft document present a defensible scientific account of data and findings for the areas being addressed? Is the synthesis of this information presented in a logical and complete manner?

2. Are the findings and conclusions supported by "best available information" or are there gaps or flaws in the information presented in the main body of the document? What additions, deletions or changes are recommended by the panel to enhance the validity and utility of the document?

3. Are there other interpretations of the data and findings that should be considered and presented to decision makers? Is there available information that has not been considered by the authors?

4. Are there data summaries and analyses that should be included in future, annual peer reviewed reports to the Governor and Legislature?

General Panel Response to the Draft Report

The draft *2004 Everglades Consolidated Report* is generally well written and well considered. It is clear that the panel's review of the 2003 Everglades Consolidated Report was considered and incorporated into this year's work. The responses of authors to review comments during the public workshop were generally direct and sufficient. The panel found the presentation at this year's workshop to be stimulating and helpful.

Monitoring versus Research

Although the panel has addressed monitoring issues in the past, we wish to put a particular emphasis on this area this year. As the Everglades restoration work progresses, scientific issues surrounding data gathering will increase.

The monitoring programs established and operated as part of managing the EPA have matured considerably in recent years. In addition, there are at least four new monitoring efforts mentioned in various Chapters of the 2004 Everglades Consolidated Report Draft. The new monitoring programs are related to implementing the Long-Term Plan, the RECOVER program, the new P criterion, and enhanced STA optimization.

At the same time the ECR monitoring is maturing, the National Water Quality Monitoring Council has been developing tools to improve the consistency and comparability of water quality data and information. Descriptions of the Council and its new tools can be found on the Council's web page: http://www.nwqmc.org.

While it is recognized that some of the new ECR monitoring efforts are reconfigurations of existing monitoring sites, there do appear to be opportunities, within the planned changes, to carefully evaluate and, perhaps, establish a more integrated monitoring effort, using new concepts and tools being developed as part of the National Water Quality Monitoring Council.

In approaching an evaluation of ECR monitoring, there are terms that need careful definition and clarification. For example, the terms 'monitoring' and 'research' are not clearly distinguished. One way to view a distinction between the two terms is to note the purpose of the information produced by each. The term 'monitoring' is usually associated with 'checking to make sure no one misbehaves'. This implies a consistent measurement compared against a set standard to determine violations. On the other hand, 'research' does not, usually, seek consistent measurements, but rather highly individualized measurements design to expose new insight on a process impacting the biology, chemistry and/or physics of water quality in the Everglades.

Data and information obtained to support management decision making, i.e. monitoring, needs to be consistent and comparable to support fair and equitable decision making. On the other hand, data and information to support research studies, in general, exploits differences from standard practice to gain new insights into scientific understanding.

Further, consider what constitutes 'management'. Laws, such as the Clean Water Act and the Everglades Forever Act, require that criteria and standards be established to express society's goals for water quality conditions. The laws, further, provide powers and responsibilities to restore and maintain water quality standards, via use of waste load allocation procedures (e.g. the TMDL process), discharge permits, compliance monitoring, and enforcement actions. When routine application of the above process is not sufficient to attain water quality standards, the laws provide additional mechanisms to support attainment, such as financial aid, planning programs, ambient monitoring, and research (where connections between loads and attainment are poorly defined, such as exists in the Everglades).

When the system being managed is huge, complex, and unique (as is the Everglades), the need for new knowledge can often become a major feature of the management effort. This is the situation that appears to exist in the EPA regarding implementation of water quality standards. When such a situation arises, there is an insatiable desire for data and information, both in support of implementing management functions, such as standard compliance and permit writing, as well as the research activities needed. It is important, however, that the purposes of the two major measurement efforts (i.e. monitoring and research) are carefully distinguished and organized, to reduce confusion about the acquisition of data, production of information for reporting purposes, and to explain (justify) the need for a number of measurement programs.

How can the measurement programs associated with the ECR be better coordinated? Perhaps via use of new tools being developed by the National Water Quality Monitoring Council. These tools are:

1. Monitoring Framework – a conceptual way of viewing the 'monitoring' associated with development of consistent and comparable data and information in support of management. The six components in the framework follow the flow of information from initial identification that such information is needed, through formulation of a strategy/design to obtain the information into the actual sampling, laboratory analysis, data management, data analysis, and reporting phases. The monitoring framework has been described in the September 2003 issue of Water Resources IMPACT, published by the American Water Resources Association.
2. Monitoring Councils – groups of people managing monitoring programs in watersheds, states, and/or regions are forming monitoring councils as a way to foster enhanced ability to share data, thus enhancing the data and information available for management decision making. The current councils, listed on the National Water Quality Monitoring Council web page, illustrate the variety of reasons the existing councils were created and also the variety of ways they operate and fund themselves.
3. Data elements – to enhance sharing of data and information among various management functions, including research. As data are generated from field and laboratory measurements, key information about the measurements is tagged to the data to better explain exactly what the data represent and why they are collected.
4. Compendium of sampling and laboratory methods (National Environmental Methods Index – NEMI).
5. New thinking about viewing the monitoring system (i.e. monitoring framework) in the same manner that 'supply chain software' views the operation of a business – all

components of the monitoring framework are inter-connected via software so the monitoring management can view the entire flow of samples, data and information, thus optimizing its management.

It must be cautioned, that while the above monitoring management tools are useful and readily applied in a more routine water quality management program, the Everglades situation is so complex that the scale of monitoring coordination has not been accomplished before. The Great Lakes and Chesapeake Bay are similar monitoring coordination efforts, but the absence of a major water **quantity** management activity in those two cases, reduces the complexity of the coordination effort compared to the Everglades.

Additional Definitions

Beyond the 'monitoring' and 'research' term definitions discussed above, there are other terms that could benefit from careful definition as part of the ECR. For example,

Compliance monitoring – within a water quality management program, compliance is associated with permit conditions as well as the ambient standards themselves. It should be clear what type of compliance monitoring is being discussed. Chapter 2 is addressing ambient standard compliance assessment. Permit compliance monitoring is discussed in other chapters, such as Chapter 4 where the STA permit compliance is assessed.

Operational monitoring – this term is used in the description of the Long-Term Plan, but its exact purpose and meaning is not clear. The implication is that it is more water flow measurement than water quality measurement oriented.

Adaptive management – an implication that future decisions are required and it is not possible to make them now with current knowledge. This term often appears within management efforts where research plays a key role. Thus, adaptive management is critically dependent upon new research results (i.e. new knowledge), as well as accurate, consistent, and comparable data and information fed into a well defined and agreed upon decision making process.

Summary and Report Recommendations

1. The National Water Quality Monitoring Council's 'Monitoring Framework' is suggested as a starting point to begin to establish a stronger scientific basis for using 'found' data to perform standard compliance assessments.

   The methods employed to compute excursions beyond water quality standards in the ECR have evolved from annual report to annual report. It is recommended that consensus be developed on a standard methodology to support the four new monitoring programs proposed in the 2004 Everglades Consolidated Report as well as to support the standard compliance assessment required by December 31, 2006. It is recommended that a more integrated and

connected monitoring design be developed that provides consistent and comparable data and information over time and space (2A).

2. While current rule making is establishing a 10 μg/L phosphorus criterion, with moderating provisions, the conceptual plan for delivering long-term water goals is based on estimations that the pre-2006 STA enhancements for the ECP will produce discharge concentrations in the range of 10 to 14 μg/L (geometric mean). The pre-2006 requirements for STAs, along with the use of an adaptive management approach and integration with CERP (including the reevaluation of existing schedules) are all necessary steps to meeting water quality goals, particularly the 10-14 μg/L range. This range is a scientifically defensible target for phosphorus levels.

3. The panel recommends and supports the continuing research effort that is on-going in the areas of the conversion of elemental mercury to methylmercury, bioavailability, the relationship between new and old mercury, the temporal and spatial trends in methylmercury, models for mercury cycling, effects of methylmercury on wading birds and multigenerational feeding studies, the cause of high mercury levels in the ENP, and the role of organic sulfur and metal sulfides on mercury cycling (2B).

4. There is a continued need to differentiate between various contributors to the reductions in phosphorus from the EAA (3).

5. Economic studies on improving the hydraulics in the STAs are needed (4A).

6. More macro-level models are needed such as equations for water transfer and mass balance calculations using rainfall and ET as independent variables (5).

7. The panel recommends and supports the continuing research efforts that are ongoing in the areas of tree islands, wading birds, and exotic species, the rehydration of the Rotenberger area, and the LILA project. It is extremely important to examine the multi-generational effects of mercury on wading birds (see chapter recommendations) (6).

8. A separate workshop or working group should be convened to integrate the hydrology information and the ecological studies. The format of data analysis (and chapter writing) contributes to detailed analysis of each project, but there is never time to integrate all of these studies. Consequently, overarching hypotheses, data analysis, and conclusions are not drawn. LILA is designed to meet some of these objectives, but an analysis should be conducted of the whole research program (6).

CHAPTER 1: INTRODUCTION TO THE 2004 EVERGLADES CONSOLIDATED REPORT

It is clear that the information presented in this chapter fulfills the requirements of the 1997 Everglades Oversight Act and the 1994 Everglades Forever Act in terms of reporting income and expenditures (projected and actual). The review panel continues to believe that this chapter is of utmost importance, given the increasing level of public interest and scrutiny regarding the Comprehensive Everglades Restoration Plan (CERP). Chapter 1 continues to 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.

Overall, the panel found this chapter to be concise and very well written. The eight-chapter format continues to be logical and this year's draft report is easier to read than in previous years, undoubtedly reflecting a more precise analysis and drafting process as experience increases. The panel supports the revised orientation of chapters 5 and 6.

Since first included in the 1999 report, the section describing the District and other governmental agencies has been improved. It is it critical to understanding the balance of the Report.

The panel notes efforts of the District in considering comments made at the 2003 public hearing on the consolidated report.

CHAPTER 2A: STATUS OF WATER QUALAITY IN THE EVERGLADES PROTECTION AREA

Chapter 2A of the Everglades Consolidated Report (ECR) is a well written and documented description of both the *data analysis* methods employed in assessing water quality impairment in the Everglades Protection Area for Water Year 2003 and the results of the data analysis. The Chapter also provides a connection to previous ERC annual assessments, noting in particular changes in the methods over time and providing a comparison of results.

The 'status of water quality' is defined in Chapter 2A as excursions beyond 'criteria' that have been legally established for the Everglades (i.e. Chapter 2A is an assessment of water quality impairment rather than an assessment of the broader status and trends of water quality in the Everglades). The Everglades water quality 'criteria', in essence, establish management goals for water quality conditions sought in the Everglades. Chapter 2A examines excursions beyond 'criteria', at sites where sampling occurs, 'using available data and findings'. The data are stored in two databases: (1) The South Florida Water Management District's (SFWMD) DBHYDRO, and (2) SFWMD's Everglades Research Database (a nutrient gradient sampling program).

Compliance Determination Methodology

The assessment of water quality is both guided and, from a scientific point-of-view, limited by available data and legal goals. The authors of Chapter 2A employ the latest scientific methods to estimate compliance with Everglades water quality 'criteria'. The 'Excursion Analysis' section of Chapter 2A, as the authors note, is a balance between a number of methods currently employed in the field of water quality impairment assessment (e.g. the latest scientific literature, previous ECRs, Impaired Waters 303(d) computations, and U.S. Environmental Protection Agency exceedance frequency recommendations) and the limits imposed by available data. Maintaining this balance forces the Chapter's authors to be in a constant search for the 'best fit' analysis methodology.

The authors are to be commended for the manner in which they account for the statistical uncertainty that arises when an area the size of the EPA is assessed for 'criteria' excursions using limited samples taken at limited sites. In attempting to employ statistics correctly, with limited data, the authors employ a suite of methods to assure scientific integrity with each situation. For example, when the number of samples at a site is 28 or larger, the binomial hypothesis test is employed – a test that evaluates the statistical significance of the frequency of excursions. When the number of samples available is less than 28, the above test is not deemed properly supported. Instead, the 'raw score' approach is employed. Employing a variety of methods to assess excursions raises the possibility that the excursion assessment, at different stations, is not comparable.

With the state-of-the-art expanding in the field of assessing water quality impairment, new methods and extensions of existing methods are appearing in the scientific literature. For example, the Smith et al (2001) approach to assessing excursions beyond a water quality standard (utilized in the ECR report), has been extended by Gibbons (2003) by incorporating the

actual measured concentration into the analysis rather than using only the binary determination of whether or not an observed measurement exceeded the regulatory standard.

Chapter 2A clearly states the hypothesis being tested – unlike many similar reports employing statistical tests of water quality 'criteria' excursions (Griffith, et al. 2001). Also, excursion categories are clearly defined for each method employed to compute excursion frequency.

The methods employed to determine compliance with standards (criteria) have evolved from year to year in Chapter 2A of the ECR. Is there an effort underway to develop broad consensus on THE method(s) to be used to determine compliance for the final assessment legally required by December 31, 2006? Are the new monitoring programs proposed in the 2004 Everglades Consolidated Report (Long-Term Plan, RECOVER, and P-criterion compliance) to employ a common method for determining water quality standard (criteria) compliance – methods that relate to those employed in Chapter 2A?

Context for Reporting Excursion Findings

Only constituents classified as a concern or potential concern are discussed in detail in the report. By focusing detailed discussions in Chapter 2A only on problems, there is concern that the broader overview of water quality conditions in the Everglades is not communicated – i.e. placing the problem areas in proper context. The title of the Chapter is "Status of Water Quality in the Everglades Protection Area" but the information provided tends to focus on problems.

To elaborate further, Chapter 2A includes in its analysis 19 water quality variables and 62 pesticides measured at 160 sites (not all variables are measured at all sites), if the separate numbers presented are assembled correctly into one number. The reader must progress a number of pages into Chapter 2A before obtaining a brief summary of water quality in the EPA (page 2A-16, second paragraph).

> "Comparison of WY2003 water quality data with applicable Class III water quality criteria resulted in excursions for six identified water quality variables. These excursions were localized to specific areas of the EPA, with the exception of DO, which exhibited excursions in all regions."

Five of the 19 pesticides were classified as 'concerns'. Natural conditions are deemed to be the cause of the dissolved oxygen excursions and an alternative criterion is being recommended – one that accounts for the natural conditions of the Everglades. The summary that introduces Chapter 2A does not include this broader overview of water quality status/conditions, but rather presents the specific constituents that are of concern.

Following the brief overview provided on page 16, Chapter 2A proceeds to discuss, in detail, identified problems areas, further elaborating on the nature of the excursion and potential causes. These discussions are not based on acquisition of additional data as part of a scientific evaluation of each problem area and/or constituent, but rather on further evaluation of existing data and additional interpretation.

It is recommended that the broad overview of water quality status be stated in the opening 'Summary' section in order to better context the focus on problem areas.

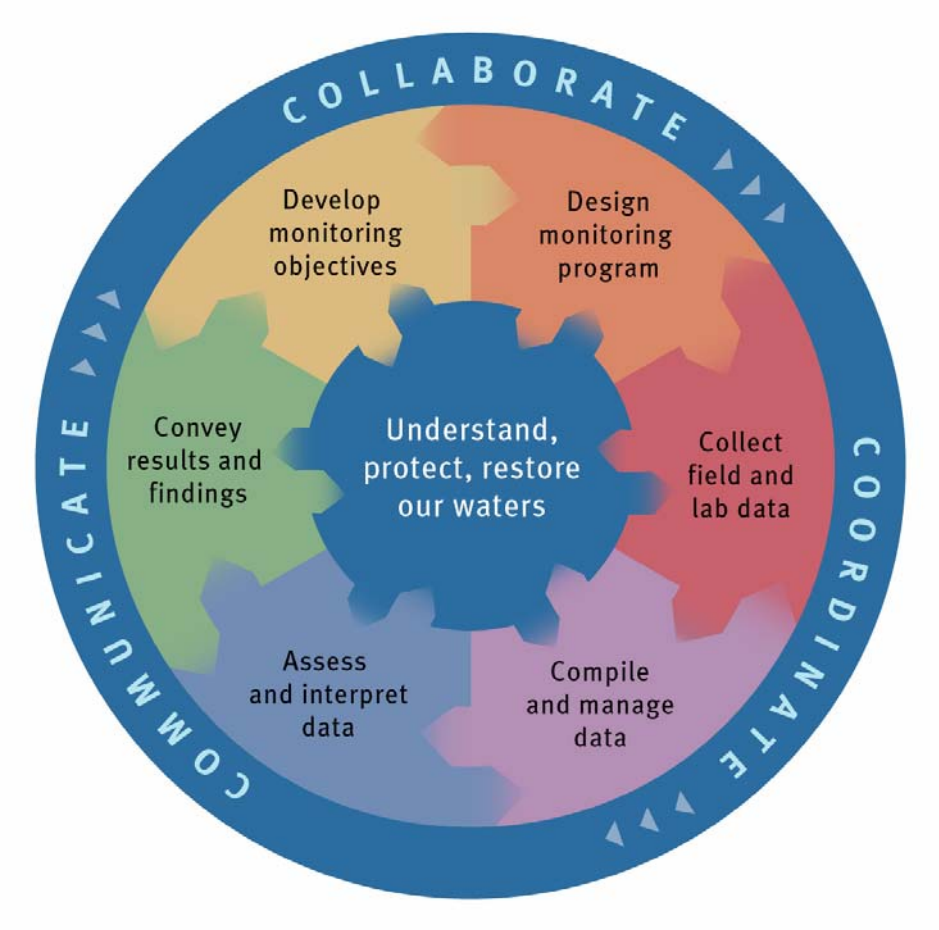
One last point on this topic, the excursion assessment does not include trends in water quality that could help the reader understand if the current excursions are a developing problem or a retreating problem. It may be useful, for those constituents that violate their standard, to present a time series plot of the past ten years of concentrations relative to standards in effect during each of the years.

Monitoring Design Documentation

While the above review of Chapter 2A recognizes the efforts of the authors to document *data analysis* methods and acknowledges that references documenting sampling and laboratory methods are available, the ERC report does not document the design of the sampling programs that generate the data placed in the database. Readers of Chapter 2A are referred to the District's Website (http://www.sfwmd.gov/org/ema/envmon/wqm) to review information about current SFWMD monitoring programs.

It is acknowledged, on the web page, that sampling frequency varies by site depending on site classification, variable group, and hydrologic conditions. Monthly sampling is, generally, associated with interior sampling sites while biweekly sampling is associated with control structures (when flowing). These frequencies (12 and 24 per year), by definition, do not match the frequencies required by the data analysis methods discussed in the report (minimum of 28 per year). Nor does the Chapter 2A or the web page discuss why the monitoring design fails to provide sufficient data to support the selected water quality excursion methodology. There seems to be a disconnect between the design of the water quality monitoring programs and the ultimate use of the data for excursion analysis.

The National Water Quality Monitoring Council has recently published a description of its proposed 'Monitoring Framework' (September 2003 issue of Water Resources IMPACT). The framework is presented below to facilitate further review of the monitoring program elements supporting the excursion analysis in Chapter 2A.



The framework consists of six tasks ('cogs') deemed critical to the creation of a scientifically sound, information goal-oriented, water quality monitoring program. The first task is to identify information objectives. The second task is to design the monitoring program (e.g. sampling locations, sampling frequencies and variables to measure). The third task is to clearly document the methods used to conduct sampling and laboratory analysis while the fourth task is to manage the data in a manner that facilitates creation of data records ready for data analysis and interpretation (the fifth task – the task described in detail in Chapter 2A). The sixth task is to report findings.

From reading Chapter 2A and reviewing the web page, it is not possible to understand the logic that connects the monitoring design (12 to 24 samples per year) to the data records needed to support the chosen data analysis and interpretation used in the excursion analysis (at least 28 samples per year). It is recommended that the monitoring design behind the excursion analysis reported in Chapter 2A be examined to determine if it is possible to develop a more integrated and connected monitoring design – a design that provides consistent and comparable data and information over time and space.

'Found' Data Complications

As a reader of Chapter 2A progresses through the well documented 'Excursion Analysis' descriptions (pages 2A-11 through 2A-14), one is struck by the scientific hoops the authors are having to jump through in order to overcome the limitations created by using 'found' data (or 'secondary data sources') to perform a scientifically sound excursion analysis. In other words, there is no uniquely designed and operated monitoring program to measure standard compliance! The authors are attempting to use, in a scientifically sound manner, data collected for other purposes to perform an excursion analysis. The excursion analysis in the Everglades Consolidated Report (ERC) is 'piggy backed' on other monitoring programs.

Of course, in the management of an ecosystem as large as the Everglades, it may not be possible to design and operate a water quality monitoring program that is used for only one purpose. It should be possible, however, to coordinate the design of monitoring programs to insure that sufficient data is available to support the multiple information goals associated with each sampling site. The National Water Quality Monitoring Council's 'Monitoring Framework' is suggested as a starting point to begin to establish a stronger connection between the data collected and that needed to support the chosen data analysis methods. The U.S. Environmental Protection Agency (2003a) recently published a list of 10 elements of a monitoring program, operated by a State agency, which includes considerable emphasis on monitoring strategies that carefully connect information goals with the monitoring design and operations.

The issue of 'found data' is being addressed by the U.S. Environmental Protection Agency's Office of Information Analysis and Access. A report on the topic is currently being finalized and should be released soon. Hopefully, the report will provide insight into the procedures to be followed to insure that 'secondary information products' (information produced from data collected for other purposes) are as scientifically sound as possible. The question remains: Is it possible to design a more coordinated monitoring system to provide a stronger foundation for a scientifically sound compliance evaluation? Such an approach appears to be planned for measuring compliance with a new TP criterion, discussed below.

Conclusions

Chapter 2A defines water quality status in terms of violations of water quality 'standards'. With this qualification, the Chapter clearly explains the methods employed to compute standard compliance and presents the results in an easy to read and understandable manner. The use of 'found' data to perform the excursion analysis results in employing several methods to determine standard compliance - in order to employ scientifically sound methods within the limitations of the available data.

Recommendations

It is recommended that the broad overview of water quality status be described in the opening 'Summary' section in order to better context the focus of Chapter 2A on problem areas – areas where water quality standards are violated.

It is recommended that the monitoring design behind the excursion analysis reported in Chapter 2A be examined to determine if it is possible to develop a more integrated and connected monitoring design – a design that provides consistent and comparable data and information over time and space. This recommendation is especially relevant to the new monitoring programs to be designed and implemented in the next few years.

CHAPTER 2B: MERCURY MONITORING, RESEARCH, AND ENVIRONMENTAL ASSESSMENT

This year's Mercury Monitoring, Research and Environmental Assessment chapter (2B) is an excellent overview of the mercury problem in the Everglades, how the SFWMD has addressed concerns about environmental problems in the Everglades, and the new initiatives to understand mercury cycling. The data, models and conclusions in chapter 2B reflect the complex problem as faced by many agencies dealing with mercury in freshwater ecosystems. The data generated by the SFWMD are proving useful for other aquatic ecosystems.

The authors are to be commended on writing a chapter that is very readable and accessible to a broad range of readers. This years report is more readable than previous reports, an important aspect for stakeholder involvement. Further, it makes the data readily accessible to scientists not previously familiar with the Everglades. The glossary of mercury-related terms is excellent. The chapter 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, especially given the new research by G. Heinz. It suggests that some herons and egrets (top predators in the ecosystem) might be more vulnerable than once thought. Dr. Heinz's research indicates that wading birds may be seven times more sensitive to mercury than ducks and other species previously examined in a laboratory. However, the species of wading bird he examined is not given, and there are likely to be great differences among wading birds, particularly given their size and differences in sizes of prey fish eaten. Specific results should be presented in the chapter as this is a critical point. Further, the initiation of a multigenerational feeding study of fish-eating birds is important because, even in ducks, multigenerational effects were found.

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, and 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 references. 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. Both hypotheses and statements need references. As has been mentioned for previous Everglades Reports, references to the published literature would aid the reader, and this should be rectified in the final report. Providing references for each step, or assumption, in the development of the mercury cycling in the Everglades, would aid the reader in evaluating the overall model.

One other general comment relates to examining mercury levels seasonally. That is, it is critical to understand how mercury (and associated components) varies seasonally. This is a larger

question that also deals with whether mercury levels are of greater concern, for example, during the breeding season when wading birds are feeding vulnerable chicks.

Overview of Research

Many of the research needs as suggested by the Review Team in 2003 have been initiated. While it is intriguing that results are available on the work at Patuxent Wildlife Research Center on the in-ovo effects of methylmercury, details of this research were not presented, and it is critical to do so. In addition to hatchability and viability, future work should include sublethal behavioral effects in young chicks that might lead to the 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 2004 as the problem is ever changing. The data suggesting that the mercury signal is largely local atmospheric transport deserves continued study. Further, the finding that newly deposited mercury is converted to methylmercury over a period of hours to days deserves special note because it illustrates the importance of continuous monitoring of atmospheric (particularly local) deposition.

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 emphasis on using organisms as the endpoint of concern for mercury is an important decision. Continued monitoring of mercury levels in bass and great egrets provides data essential for continued research, ecosystem management, and possible human risk. Declines are noteworthy, but the lack of a decline in Everglades National Park is reason for concern. The declines in mercury in wildlife track mercury load reductions, and indicate that declines occur more rapidly than once thought.

The research emphasis on effects 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 main body of the chapter accurately reflects the four main issues with mercury in the Everglades. This reorganization makes the report easier to read, and much more informative for stakeholders.

Key issues discussed this year are similar to the 2003 Everglades Consolidated Report, and include:

1. The relative contribution of local vs. long-distance atmospheric transport of mercury into the Everglades system; whether load reduction has resulted in reductions in mercury in wildlife. This includes the role of "new" mercury vs. old.
2. Mercury modeling in the Everglades.
3. The factors that affect the transformation of mercury into methylmercury, and the removal of mercury from the system (through biodilution).
4. The effect of source reduction on receptors, notable piscivorous fish and wildlife.

The Atmospheric Mercury Cycle

Elucidating atmospheric mercury cycling is key to understanding (and managing) the mercury problem in the Everglades, and this section states the problem clearly. The graphics are clear, yet show the complexity. In this regard, the continued monitoring and modeling 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. 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 (see below).

Of all the issues in 2B, mercury cycling is one of the most controversial, largely because it is difficult and time-consuming to obtain the data necessary to answer the key questions. The complementary study in dated sediment cores is very important because it shows the increase in atmospheric deposition in the Everglades. The work should continue so that the possible downtrend can be verified.

While most of the information presented to examine local vs. global sources for the atmospheric mercury deposition is straight-forward, some aspects are unclear. There is still no discussion of atmospheric data from the southern US. The percent of deposition from regions other than South Florida should be quantified.

The ability of aquatic biomass to remove mercury through biodilution was a key issue in previous years, and for this reason, is mention in the 2004 report. The 2004 report clearly addresses it, noting that biodilution hypothesis does not reflect reality. Providing data to illustrate this point was very important.

The important new finding that "new" mercury is having the greatest effect on mercury levels in biota, especially fish, requires considerable attention in this chapter. It should NOT be relegated to appendices and models that the public find difficult to wade through. This has major implications for mercury cycling in different sections of the Everglades, as well as in other aquatic systems. It also provides a measure of hope for mercury contaminated systems which would be useful to introduce into the general public discussion, as well as for policy-makers.

Modeling of Mercury in the Everglades

The models developed to understand mercury cycling in the Everglades are extremely important and deserve more description in the main chapter itself. While it is always useful to refer to appendices (and these are necessary), the inclusion of basic information about the models and why they are critical is essential. Modeling should go hand in hand with the research to ensure that the information required for the models (such as information on biomass of lower trophic levels) is collected. Such information is essential for further model work.

The inclusion of parameters for new vs. old mercury in the E-MCM models seems essential to move the models forward in predicting trends in mercury levels in bass and other top level predators. It would also account for the discrepancies between the model outcomes for mercury in fish, and the actual levels in fish. The new/old mercury discussion will be helpful for a wide range of stakeholders.

Sulfur Cycling and Methylmercury Production

The role of sulfur and methylation of mercury has been a key issue in the Everglades for some time. Sulfate entering the Everglades (mainly from the waters of the EAA), combined with new mercury entering the ecosystem (from atmospheric deposition) controls the rate of mercury methylation. Sediments are the primary source of methylation in the Everglades. The excess in sulfide concentrations suppresses methylation in the northern Everglades. The variations in sulfide and sulfate concentrations account for a variation in mercury concentrations of nearly two orders of magnitude across the Everglades.

While this section is quite clear and easy to read, it would profit from more references because of the controversial nature of the information. Further, the section needs to directly address the issue: would reductions in sulfate in the northern Everglades result in higher mercury concentrations in fish in these regions?

Responses of Everglades Ecosystems and Wildlife to Source Reduction

The organization of the 2004 Consolidated Report makes the key questions obvious. The discussion about receptors is addressed this year in terms of its relationship to source reduction. Ecological risk to wildlife is the primary driver, and to address it directly is ideal. 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.

Mercury concentrations in bass in most of the Everglades show clear declines in mercury concentrations from 1990 to the present. However, there is not a clear decline in Everglades National Park is cause for concern. There are also declines in mercury in the feathers of Great Egret chicks. Since chicks are fed entirely of food obtained from the local area, levels in the feathers of chicks are a good indication of local exposure.

The inclusion of historical data is important because it demonstrates what was believed to be the case; mercury levels increased historically, and then declined recently. Careful consideration should be given to the difference in mercury levels in feathers from different regions of wading birds. Direct comparisons should not be made unless the same feather types are used. Correlation of these data with sediment cores would be useful. It is important that governmental agencies, the SFWMD, and stakeholders recognize that continued monitoring is key to our understanding of both to spatial and temporal patterns.

Conclusions

The Everglades mercury monitoring program is the most comprehensive program in the world, and is providing state-of-the- art information on the overall mercury cycle, factors affecting mercury cycling within the ecosystem itself, spacial and temporal differences in methylmercury in biota, and effects of methylmercury on biota. The specific development of the mercury models is critical to understanding and predicting future mercury levels. The new initiatives to understand mercury cycling within the Everglades will contribute markedly to the understanding of both mercury cycling and management implications.

The finding that mercury concentrations in biota (fish, egrets) have declined over the last ten years is exciting, and a tribute to management of mercury inputs to the Everglades. Mercury in biota declined at a faster rate than predicted by the models, leading to increases in our knowledge about the bioavailability of "new" (newly deposited) mercury compared to old mercury residing in the soil. Continued study of the biodynamics of new vs. old mercury is critical to our understanding of mercury cycling.

The report is valuable and comprehensive, providing needed information for a wide range of stakeholders, including regulators, managers, farmers, and the general public. However, some of the statements need citations to allow evaluation and to provide background for interested parties. Some of the data from Appendices should be incorporated into the chapter itself to provide necessary documentation.

Recommendations

1. Research should continue on the factors that contribute to conversion of elemental mercury to methylmercury, and bioavailability, especially in the sediment.
2. Research on the relationship between new and old mercury is critical to our understanding of uptake of mercury in biota.
3. Research on temporal and spatial trends in methylmercury should continue, as these are some of the most extensive such data bases available worldwide in terms of spatial and temporal patterns.
4. Research should continue on models for mercury cycling, including obtaining data on some of the parameters (e.g. food web patterns).

5. Research on the effects of methylmercury on wading birds, particularly on behavioral abnormalities, reproductive effects, and multigenerational deficits should be encouraged and funded. Wading birds are unique in not being marine (i.e. having adapted to high mercury levels), yet are potentially exposed to high levels.
6. The multigenerational feeding studies with wading birds are extremely important, and should be fostered.
7. More attention should be given to the causes of the high mercury levels in the Everglades National Park area, including research on the dynamics within the sediment/biota interface.
8. Citations to the literature should be given for statements and hypotheses presented within the chapter itself.
9. The inclusion of a glossary should continue each year.
10. The role of organic sulfur and metal sulfides on mercury cycling should be examined.

CHAPTER 2C: STATUS OF PHOSPHORUS AND NITROGEN IN THE EVERGLADES PROTECTION AREA

Chapter 2C, addressing two constituents, total phosphorus (TP) and total nitrogen (TN), provides, in the summary section, a broad overview of the status of TP and TN. A separate nutrient gradient monitoring program, designed specifically to track nutrients, augments the SFWMD's DBHYDRO database. Devotion of a separate section of the water quality status chapter to two constituents emphasizes the special importance given to nutrient impacts on the health of the Everglades ecosystem. Before they are treated separately, they should be considered along with all water quality criteria and then noted as having special importance to the Everglades and discussed in more detail in a special section of the Chapter. TP and Hg impacts in the Everglades are not well defined, thus requiring additional research and consideration, beyond the routine standards compliance assessment.

Chapter 2C describes the 'holding pattern' surrounding the development and implementation of a phosphorus criterion in the EPA. Given the uncompleted process to establish a TP criterion, Chapter 2C chooses to not evaluate proposed TP criterion compliance due to the absence of a well designed monitoring program with evenly spaced monitoring sites (noted on page 2C-8, fourth paragraph). Rather the Chapter examines trends in TP over time using the default TP criterion, searching for patterns that may be of concern. The ECR, in this case, is not willing to use 'found' data to perform an assessment of proposed criteria compliance, but will wait until the criteria are formally approved *and* 'the required monitoring networks' have been established.

Is the reference to a new monitoring program design (top of page 2C-7), specifically tied to measuring compliance with the new TP criterion, implying that a dedicated monitoring program will be established solely for TP compliance purposes? Is the special treatment phosphorus receives in implementing the Everglades Forever Act the reason for creating a compliance monitoring program separate from other water quality constituents? It appears from reading Chapter 2C that the TP criterion compliance monitoring strategy is fundamentally different from the compliance 'monitoring' strategy employed in Chapter 2A where 'found' data is used to determine compliance. Will the TP and water quality monitoring program designs be coordinated?

Final Chapter 2 Observations

The data analysis protocol to be followed in analyzing data to check TP criterion compliance (five-year geometric mean) utilizes a different method from that described for other water quality variables in Chapter 2A (binomial hypothesis test). The reasons for this difference are explained (short term fluctuations higher than criterion do not create long-term biological impacts) and scientifically justified. Concern develops regarding future ECR reporting to portray 'water quality status' - when each variable is treated quite differently. Has any thought been given to how the different data collection and compliance assessments will be integrated into an overall view of water quality status, as the title of Chapter 2 indicates? Everglade water quality monitoring and assessment, in its efforts to be scientifically correct in portraying each variable, must also be able to integrate information about all the variables into a more concise reporting format that carefully meshes with the policy setting and management decision making context.

References

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U.S. Environmental Protection Agency. 2003a. **Elements of a State Water Monitoring and Assessment Program**. EPA 841-B-03-003 (Available on the web at: http://www.epa.gov/owow/monitoring/repguid.html

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CHAPTER 3: PERFORMANCE AND OPTIMIZATION OF AGRICULTURAL BEST MANAGEMENT PRACTICES

An excellent summary is presented of the best management practices implemented in the Everglades Agricultural Area and the C-139 basin, as has been the case in the past.

These practices have been very effective in reducing phosphorus mass and concentration emanating from the EAA and appear to have equal potential in the C-139 basin. A description of the progress being made with the municipalities and other contributing areas would be helpful. Have similar reductions in phosphorus occurred in the municipalities and other contributing areas? With the implementation of similar programs throughout the area, much greater improvement in water quality entering the Everglades would be expected.

An attempt should be made to explain the significant drop in phosphorus mass being discharged from the EAA. As suggested in the past reviews a significant part of the decrease in phosphorus mass discharge may be attributable to the decline in the phosphorus fertilizer industry. 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.

Questions of interest follow.

a. What impact on compliance can be expected from the results of the University of Florida/Institute of Food and Agricultural Science On-Farm Research program? Does evidence exist to show the relationship between particulate phosphorus, soluble phosphorus, organism growth, subsidence and mineralization of organic matter or from application of inorganic fertilizers?

b. A brief statement or two about the variables influencing the annual percent variations in load would be helpful. More discussion of impacts of other phosphorus contributors would be helpful in interpreting the impact of BMPs. Does phosphorus enter the Everglades from locations other than the EAA?

Specific Comments

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

Summary

An excellent summary and the presentation of TP concentrations and loadings improved the value of the summary.

Basin-Level Monitoring Results

C-139 Basin

In Table 3-6 it would be desirable to add a footnote that the three-year Actual WY2003 loads and concentrations are for only one year.

A few sentences explaining the results in Figure 3-9 would be helpful, i.e., why the significant drops in TP Loading occurred in 2001.

Why is the 3-year rolling average trending upward as shown in Figure 3-10? Just a brief sentence or two will suffice.

Permit-Level Monitoring Results

A brief description of how relative comparisons are used would be helpful.

Update on Everglades BMP Research

As mentioned in the past, the update would have been improved by presenting a summary of the results from the studies in tabular form. It is realized that reports are available or are being prepared, but most readers are not going to search for additional documents. 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?

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.

Recommendations

1. Continue the good work, and the efforts to involve the communities and rural areas 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.

CHAPTER 4A: STA PERFORMANCE AND COMPLIANCE

The STA investigators are to be commended for collecting and analyzing significant quantities of data for the various STAs evaluated. The inclusion of summary tables helps the reader only interested in a quick overview of the STA results.

The lack of detail about the data presentations leaves the reader wanting more information to fully understand the results. Without reading Chapter 4B it is difficult to interpret the performance and compliance data. A combination of Chapters 4A and 4B should be considered.

General Comments and Questions

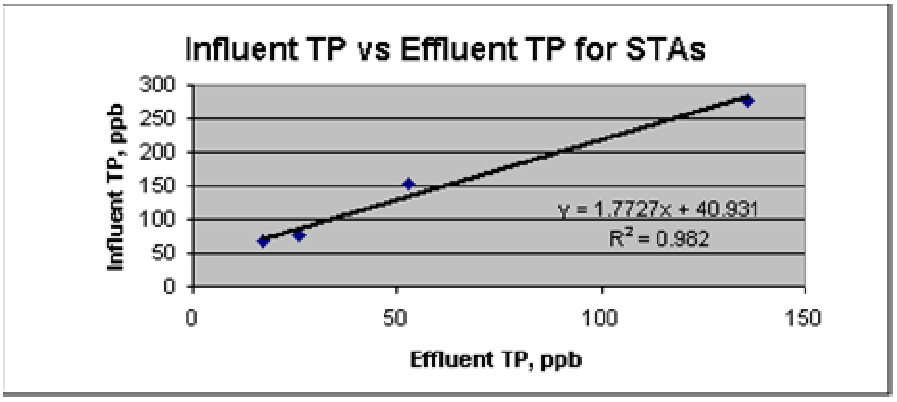
By discussing mercury, DO, and Vegetation management for all STAs in one section, considerable redundancy could be eliminated.

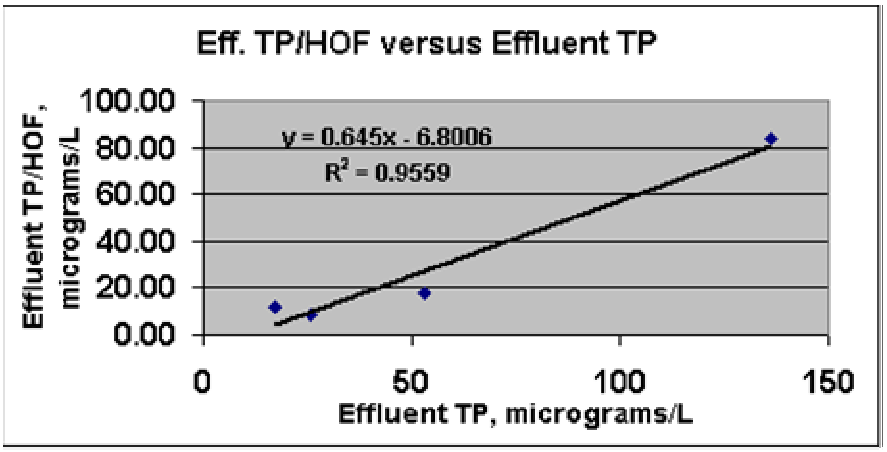
For those STAs that are overloaded hydraulically and with TP, how soon, if ever, are the loads to be reduced to the design level?

It appears that phosphorus removal in the STAs is directly related to the influent TP concentration and the hydraulic overload. The following graphs illustrate this.

Relationships Between Hydraulic Loading Rate, Effluent TP, Influent TP and the Hydraulic Overload Factor

STA	HLR cm/d	Eff TP ppm	Inf TP ppm	Hydraulic Overload Factor	Eff TP/HOF
1W	7.4	53	154	3	17.67
2	3.67	17	67	1.4	12.14
5	3.45	136	277	1.62	83.95
6	5.4	26	77	3	8.67





The relationship between influent and effluent TP is shown in the first plot, and the effect of hydraulic overload on the effluent TP concentration is shown in the second plot. Although subjective, it appears that correcting the overload would result in considerable improvement in the performance of the STAs.

If feasible, consideration should be given to operating more of the cells in the various STAs in series. This will definitely improve the hydraulic characteristics.

Section Comments

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

STA-1 East Update

With water flowing from Cell 7 into Cell 6, there is a considerable opportunity for severe short-circuiting to the first one or two outlet structures. If feasible, it would be advisable to discharge from Cell 6 at the lower two or three outlets at the southern end of the cell. For the uninitiated, it may be desirable to identify the blue squares as inlet and outlet structures. Having multiple cells in series should improve the hydraulics of the STA considerably.

STA-2

Have economic studies been conducted comparing the costs of improving the hydraulics in the STAs with costs associated with unmodified STAs and other forms of treatment and vegetation management? If so, a brief summary of the results would be useful.

STA-2 Total Phosphorus

The results indicate that the STAs receiving high concentrations of TP are overloaded or have poorly designed hydraulic characteristics. It appears that the STAs are operating at less than optimum. It is likely that significant improvement in performance would be obtained by simply reducing the loading rates.

A kinetic analysis of the various STAs is needed.

STA-2 Other Water Quality Parameters

In the future, it may be desirable to cover the DO issue in a separate section for all STAs. This would result in reducing the repetition.

STA-3/4

In the detailed design what are the enhancements referred to in the last paragraph on page 4A-31?

STA-5

When making reference to a concentration or flow as being "considerably" lower or higher, why not show the mean and some statistical inference.

Conclusions

1. The STA investigators have collected and analyzed significant quantities of data for the various STAs evaluated, and are to be commended for their efforts.
2. Some of the STAs are overloaded hydraulically and with TP, and are operating at less than maximum efficiency.
3. Improvements in STA performance can be expected if loading is reduced to design levels.
4. It appears that phosphorus removals in the STAs are directly related to the influent TP concentration and the hydraulic overload.

Recommendations

1. Combining Chapters 4A and 4B should be considered.
2. Reduce loadings to STAs as soon as possible so that an accurate measure of the capabilities can be achieved.
3. Continue the efforts to convert the existing STAs to series operation.
4. Consider eliminating redundancy by discussing mercury, DO, and Vegetation management for all STAs in one section.
5. Conduct economic studies comparing the costs of improving the hydraulics in the STAs with costs associated with unmodified STAs and other forms of treatment and vegetation management.

CHAPTER 4B: STA OPTIMIZATION AND ADVANCED TREATMENT TECHNOLOGIES

Chapter 4B is concise, clear and easily understood for the most part. An occasional detail and clarification is needed, but overall, an excellent Chapter. General and specific comments are presented for various sections of the Chapter.

Summary

In the fifth paragraph, it is stated that phosphorus can be stored for long periods. Do you have any idea for how long? Determining this factor would give an indication of the design life for the STAs.

STA-1 West

It is good to see the implementation of the compartmentalization study to improve the hydraulic characteristics. It has been established for many years that one of the most influential variables associated with biological treatment systems is the hydraulic residence time.

Water depths are given for the STA-1W test cells, but an estimate of the depths in the various cells of the STAs are not given. Are there differences in mean depths between the individual STAs or the cells within an STA? If so, what effect on performance do you anticipate or have determined?

Treatment Performance

It appears that the inflow from G-303 and G-255 comes from essentially the same source. How far apart are the two inlet structures? Could this distance account for the differences in influent concentration of TP?

Is it possible that the large mass of SAV improved the hydraulics of Cell 4; therefore, increasing the contact time with the plants and other organisms removing phosphorus?

Rather than say “greater’ why not use a percentage change or multiple factor to describe observed differences?

Vegetation

Submerged and Floating Aquatic Vegetation

Again, rather than use vague terms such as “more pronounced”, why not show ranges or values.

What would vegetation control cost if all STAs were operated as SAV based systems?

STA-6

Vegetation

Has a materials (nutrients) balance been attempted to determine if saw grass took up more TP than the other plants?

Sediment

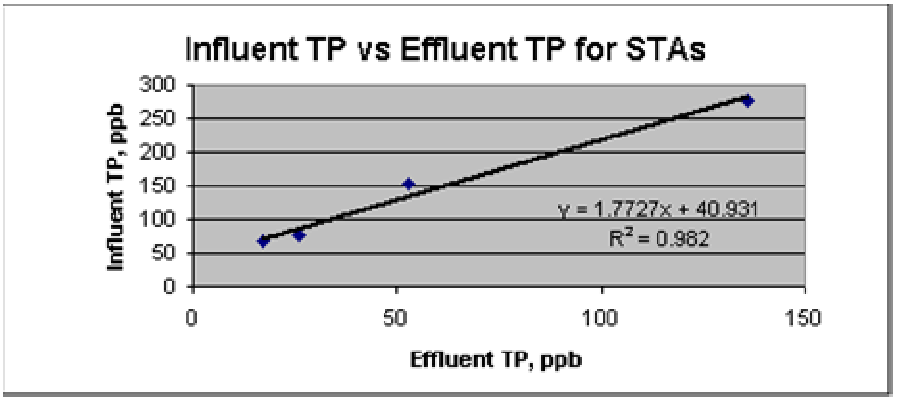
It appears that the flow was distributed to cells 3 and 5 in portion to their surface area; therefore, the last sentence on page 4B-11 appears to be incorrect. Cell 5 apparently did not receive a higher hydraulic load, perhaps a larger mass of TP.

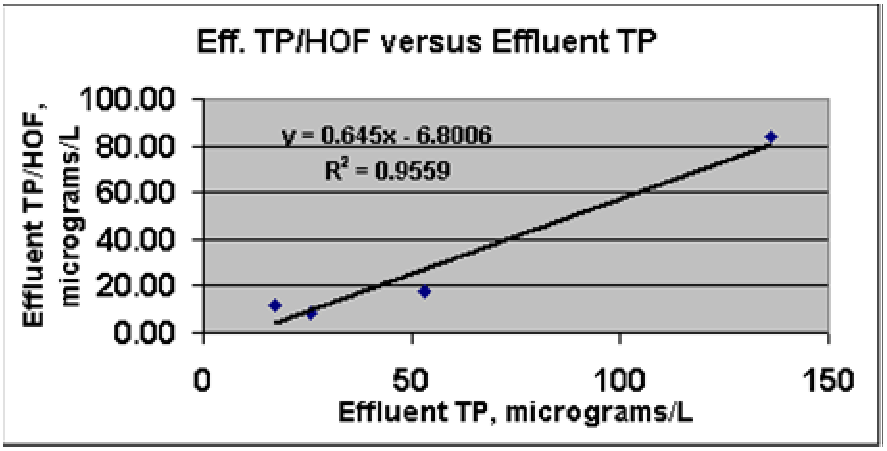
Long-term Trends in the STAs

An examination of the TP effluent concentrations and the overload factor reported (i.e. 3 times design flow, etc.) results in a significant relationship between the two factors. It is likely that the following figure is based on inadequate and incomplete data, but it does show a significant relationship between effluent TP concentrations and hydraulic overload.

Relationships Between Hydraulic Loading Rate, Effluent TP, Influent TP and the Hydraulic Overload Factor

STA	HLR cm/d	Eff TP ppm	Inf TP Ppm	Hydraulic Overload Factor	Eff TP/HOF
1W	7.4	53	154	3	17.67
2	3.67	17	67	1.4	12.14
5	3.45	136	277	1.62	83.95
6	5.4	26	77	3	8.67





STA-1W Test Cell Research

It is true that the chemical treatment processes would alter the water quality parameters and may adversely affect the ecosystem; however, creating a single controlling factor such as phosphorus may also alter the ecosystem in ways not yet understood. This said, it is obvious that "green" technology offers less risk and great potential to allow the recovery of the Everglades.

North Test Cells

Does the infrequent production of an effluent TP of 10 micrograms/L indicate that the "green" treatment processes without some form of chemical pre-treatment cannot be expected to reach the "magic" level of 10 μg/L? If this were the case, why would one expect the phosphorus concentration in the Everglades to achieve 10 μg/L uniformly over the entire area?

Why not use a uniform set of Test Cell Designations? Redefining designations in the text differently than those given in Table 4B-7 makes it difficult to follow your presentation.

South Test Cells

Were there differences in the dominant plant species in cells E-1 and E-2 that may have contributed to the differences in performance?

Advanced Treatment Technology

This section is a good concise summary of the PSTA field-scale test work.

PSTA Field-Scale Test Facility

Nature can be cruel! The best-laid plans are frequently distorted by the demon nature. Even with nature's fickle intrusion, useful results were obtained.

Mesocosms

It would be useful to report the thickness of the low and high application rates of the three chemicals used.

STA-3/4 PSTA Demonstration

A summary table outlining the major components of the demonstration project would be useful.

Linkage of Research and Monitoring to STA Management

The sequencing of the various treatment methods will have a positive effect on the hydraulic residence times in the overall systems. Considerable attention should be given to the flow patterns and HRT in the planned demonstration project.

Conclusions

Many of the conclusions reached in Chapter 4A apply to Chapter 4B and the pertinent ones are repeated below.

1. Chapter 4B is concise, clear and easily understood, and the study group are to be commended for their efforts.
2. Implementation of the compartmentalization study to improve the hydraulic characteristics is a significant step toward assessing the potential of the STAs as a phosphorus removal process.
3. A materials (nutrients) balance should be attempted to determine the uptake of phosphorus by the various plant systems in the treatment cells.
4. "Green" technology offers less risk and great potential to allow the recovery of the Everglades.
5. All of the STAs were overloaded hydraulically and with TP, and are operating at less than maximum efficiency.
6. Improvements in STA performance can be expected if loading is reduced to design levels.
7. It appears that phosphorus removals in the STAs are directly related to the influent TP concentration and the hydraulic overload.
8. The infrequent production of an effluent TP of 10 μg/L indicates that the "green" treatment processes cannot be expected to reach the "magic" level of 10 μg/L; therefore, why would one expect the phosphorus concentration in the Everglades to achieve 10 μg/L uniformly over the entire area?

Recommendations

Most of the recommendations in the review of Chapter 4A are applicable to Chapter 4B. The pertinent recommendations are reproduced below:

1. Combining Chapters 4A and 4B should be considered.
2. Reduce loadings to STAs as soon as possible so that an accurate measure of the capabilities can be achieved.
3. Continue the efforts to convert the existing STAs to series operation.
4. Conduct economic studies comparing the costs of improving the hydraulics in the STAs with costs associated with unmodified STAs and other forms of "green" treatment and vegetation management.

CHAPTER 5: HYDROLOGY OF THE EVERGLADES PROTECTION AREA

It is appropriate that hydrology was treated as an independent chapter in this year's report. Hydrology and hydrodynamics are two fundamental drivers that shape the function and structure of a wetland. The information should be provided in a clear and user-friendly manner to maximize usage and/or reference throughout the whole report.

The main objective of this chapter, as stated, is to depict the hydrology of the Everglades Protection Area (EPA) in Water Year 2003 (May 1, 2002 to April 30, 2003). The monthly means of rainfall, potential evapotranspiration and water level data of the EPA areas are clearly presented in graphic forms. Surface water inflows and outflows data of individual areas are also presented in clear graphic forms. There is a rather detailed description of the surface water inflows and outflows in all the areas. For people that are not familiar with the geographic relationship of the areas, the information does not help much. It would be much more clear and useful that the information is represented in a diagram with arrows to indicate directions and magnitudes of the flows among areas. A flow chart of water transport all the way from Lake Okeechobee to the Florida Bay with mass-balanced means of the Water Year 2003 would be very desirable. A map demonstrates the geographic relationship of the inflow/outflow structures is essential for users to figure out water mass transfer and balance of interested areas.

While most basic hydrological observations of EPA are presented in the chapter, little interpretation or discussion of the data is presented. Important hydrological information such as flow directions, hydraulic water residence times and rainfall/evapotranspiration vs. flow, distribution and storage of water mass in various areas is lacking. Also lacking is the description of how the data are collected and analyzed and the statistics. As a scientific database, users need to know methods of data collection and analysis, the confidence level, variation and extremes. To help potential users, simple tools of calculation, e.g., simple models or equations for water transfer and mass-balance calculations among areas using rainfall and evapotranspiration as independent variables could be provided in the chapter. More interpretation and discussion of the data certainly would enhance the importance and usefulness of the chapter.

Summary

This chapter contains very important basic hydrological data that are critical to the interpretation of other studies in the EPA. Hydrodynamics interpretation and discussion of the data, such as water flow rates, water mean residence times, and rainfall/evapotranspiration control of the hydrology, and statistics are lacking.

Recommendations

1. Include more discussion and interpretation of the data, especially rainfall/ET vs. the hydrology.
2. Include simple models or equations for water transfer and mass balance calculations using rainfall and ET as independent variables.

3. Add methods for data collection and analysis and statistics.
4. Use metric system in the main text (may include a conversion table for the convenience of non-metric system users).

CHAPTER 6: ECOLOGICAL EFFECTS OF HYDROLOGY

The restoration of the Everglades has as a primary objective the establishment of an ecosystem with appropriate ecosystem structure and functions. One goal of restoration was to restore, to the extent possible, the natural hydrology of the Everglades. The SFWMD operations, regulations, monitoring, and science are directed toward examining wildlife ecology, plant ecology, ecosystem ecology, and landscape ecology within a framework of the hydrology of the Everglades. This chapter summarizes their on-going work in these disciplines.

While the individual sections are well-written, informative, exciting, the chapter would profit from using the same overall format for each section. That is, the same questions should be answered for each research project, in the same order. As written, the chapter is choppy. Every section should include a section called - Regulatory or Research Need - that addresses how the individual research contributes to management, permitting, regulations, model parameterization, or other research needs. Each section should also include a section about uncertainties, as well as including appropriate citations for important statements or assumptions of the research. Overall, every section of the chapter should have appropriate citations, estimates of variance, sample sizes, locations of all samples, temporal patterns of sampling and other methodology. The significance of the metrics used in each section should be included. Common names should be used throughout, with the scientific name given the first time a species is mentioned. A concluding section that puts all the research in context, and elucidates the management implications, is critical.

Ecology by its very nature involves complex relationships, making it difficult to have clear-cut cause and effect relationships. Thus the SFWMD approach of addressing particular indicators of the health of the system is appropriate. Since it is not possible to examine all species, species assemblages, and processes, indicators must be selected for examination and monitoring. Five key indicators are examined in some detail in this chapter: wading birds, food webs, tree islands, *Lygodium* (an invasive species), and the Loxahatchee Impoundment Assessment (LILA).

Wading birds were selected because they are top level predators, are visible and of interest to the public, and can be observed and studied both in the field and in the laboratory. Tree islands, and ridges and sloughs, are important features of the Everglades that must be preserved and re-established. *Lygodium* is an invasive species that can be tracked as an indicator of environmental impact, and the LILA is an expansion of the mesocosm work, provides an opportunity to test hypotheses about hydrology, and to communicate with the public about water management issues. The latter research is an exciting project of the SFWMD.

The chapter examines four key areas:

1. Wildlife Ecology (wading birds, food webs, wildlife on tree islands)
2. Plant Ecology (below-ground biomass of tree islands)

3. Plant Ecology Ecosystem Ecology (vegetation on tree islands)
4. Landscape Ecology (temporal changes in tree islands, spatial patterns in ridge and sloughs, spread of *Lygodium*, Loxahatchee impoundment assessment)

Wildlife Ecology

Wading birds have always been a key indicator group for the Everglades, in the minds of scientists, regulators, and the general public. Nesting waders, and their reproductive success, are used as indicators of the progress of the Everglades restoration effort. There was a general decline in the number of waders nesting in the Everglades, and an increase in asynchrony of nesting. Some of these changes may have been due to heavy rains during the nesting season, as happened in many places along the Atlantic coast during this past year. Asynchrony in nesting often occurs either because of heavy rains or because food supplies are sporadic or difficult to obtain. While the Report notes that water level reversals may have been the cause, it is more likely that heavy rains and food supply differences were the proximate cause. Further, since most of the waders breeding in the Everglades are not long-distance migrants, late fledging chicks may still be recruited into the breeding population. While the running year averages for number of nesting birds is useful because it dampens out large shifts from year to year, it might be useful to actually see the data. Levels of uncertainty associated with wading bird counts, and contaminant levels, should be included.

Food web studies are extremely important in determining the basis for population changes, but it appears that significant research is required to understand the basis of the web. Citations should be used to indicate whether specific food web relationships were established for the Everglades, other regions in the southeast, or elsewhere in the U.S. Understanding the relative role of detritus may be key - and there may be both seasonal and yearly differences requiring extensive study.

The use of stable isotopes is promising and will be useful, both in understanding the Everglades food web generally, and in examining different parts of the system. This method has proven useful in a number of other regions, and comparative data will be useful. Stable isotopic analysis, however, requires a fuller description with appropriate references to document how and why it is important. While these studies are being designed, both spatial and seasonal parameters should be incorporated.

The institution of a non-invasive camera trapping technique to monitor wildlife on tree islands is an important step in understanding how wildlife use these islands (a map of tree islands by number should be included). The only drawback is that it cannot be used at night. This innovation will increase overall knowledge of wildlife use of tree islands, especially for nesting by reptiles. The section would be improved by providing some of the preliminary data.

Plant Ecology

The Rotenberger Wildlife Management Area has been the focus of study for some time, and is now experiencing an improved wet-dry season cycle that more closely resembles a natural hydrology. The overall hypotheses being examined, and the assumptions should be stated. For

instance, although the hydrology cycle has been restored, the nutrient levels have not. Since this work has been ongoing for some time, citations to work in the peer-reviewed literature should be included. The plant composition has changed, but requires considerably more time to understand the nature of the changes. Wetland plants persist indicative of a high nutrient condition, and information on the lag time for changes is critical to understanding plant ecology on the area.

The studies of below ground biomass on tree islands is aimed at understanding how hydrology affects biomass production on different tree islands. The total biomass of fine roots is a critical aspect of biomass, at least biologically. Below ground biomass is critical to understanding how changes in hydrology will affect composition, diversity, and biomass of tree islands.

Ecosystem Ecology

The focus of this project completes the examination of tree islands, and involves examination of tree island vegetation and succession. It forms the basis for understanding the ecology and ecosystem structure and function of the tree islands, and as such, is extremely important and long overdue. Definitions of terms used for tree islands should be included, such as the tail, near tail, fixed, and floating.

Looking for one index of tree island health will be difficult because of the inherent problems with most indices. Firstly, the different species composition on each tree island makes comparisons difficult. Secondly, species diversity often includes exotic species (obviously a problem). Understanding ecosystem structure and function of tree islands will be complex, time-consuming and will require many years. Setting up islands to study for a period of time will help understand both succession and the effect of varying hydrology (as well as different plant species composition).

The overall statistical methodology (CCA) might need some additional explanation in terms of hypotheses to be tested, what the data will mean, and what the implications are for management. It is extremely important to understand the role of exotic plants, fire and other human activities on tree islands, and this approach will begin to examine these factors.

Landscape Ecology

One of the advantages of the work done by the SFWMD is that all levels of biological organization can be examined, from laboratory studies of organ/reproductive effects to landscape ecology. This is one of the strong points of the SFWMD work and the Everglades restoration plan.

Examining tree island changes from 1945 to 1995 completes the overall study of tree islands, giving a temporal perspective. This is a massive project, when human activities are added to the ecology of the tree islands, yet it is essential to do this. The massive change that occurred from the 1950 to the 1970s should receive further comment.

While tree islands are an indicator feature of the health of the Everglades, the spatial patterns of ridge and sloughs is another that bears examination. Study of these features is key to management of the Everglades, including developing a method to identify intact from degraded ridge/slough landscapes. The methodology is appropriate to the problem, but the specific questions being addressed should be more clearly stated.

Understanding the invasion of exotics into the Everglades is a key indicator of ecosystem health. While IKONOS will be very useful, the District should consider ground-truthing, especially for parts of the Everglades where the understory cannot be assessed.

The Loxahatchee Impoundment Landscape Assessment (LILA) is an exciting and timely project that applies adaptive management. While the project involves sculpting the physical features of two existing impoundments (followed by water level manipulation), operations can be modified as conditions dictate. The chapter should make the methodology of monitoring during the operations much clearer, both in scope and details. Further, references to other similar management/studies should be described and referenced. It must be documented that there is increased wildlife use, and such studies should be initiated before the project begins. This project integrates some of the other key projects, such as wading birds, tree islands, and ridge/sloughs. Table 6.7 is extremely important for the overall understanding of this project.

Although the plan calls for establishment of a public kiosk for dissemination of information during the project, it seems that public dialogue should start immediately, both to prepare the public and to get their comments and suggestions. Loxahatchee is a well-used park, and there will be heavy public involvement.

Conclusions

Restoration of the Everglades requires understanding not only of hydrology, but the ecology of individual species and the complex interactions of organisms within their ecosystems. The wide range of studies undertaken this year focus on tree islands, and the ridge/slough structure. A number of innovations are exciting and will provide valuable new information for the restoration efforts. Innovations include wildlife cameras to assess use of specific habitats, data on below ground root mass, vegetation trends analysis, and active management of the LILA program. LILA will act as a bridge between small-scale microcosm experiments and large scale observational studies and monitoring in the Everglades. It provides an exciting opportunity to learn more about the processes that control succession within the Everglades, climax vegetation and ecosystem structure, and biotic relationships.

Focusing the ecological studies in one chapter allows an overview of the research contributing to our understanding, and the projects are important and well executed. They will contribute to our knowledge about the Everglades ecosystem, and fulfill the mandate of providing information for

restoration of the Everglades. The focus of the studies ranges from individual species groups (such as wading birds) to a landscape-scale - an important approach that should be maintained.

The wading bird component continues to be a key indicator of the health of the Everglades. The new use of stable isotopes for understanding food web relationships in the Everglades will provide key information to evaluate changes in wading bird reproduction and population stability.

The studies on the Rotenberger area are extremely important to our understanding of both rehydration, and increases of nutrients on species diversity and composition.

The chapter provides important and key information for understanding and managing the Everglades. The focus on tree islands is useful because it places the research within an ecosystem structure and function framework. The chapter requires more uniformity in presentation and approaches.

Recommendations

1. The overall research program on tree islands should continue as tree islands are an important component of the Everglades, particularly for biota requiring upland areas. Continued development of an index of tree island health is essential.
2. The wading bird studies should continue as they provide one of the longest data sets for evaluation of the Everglades ecosystem.
3. The trends analysis of tree islands, and ridge/sloughs should continue both as indicators of Everglades ecosystem health, but as a way of understanding biodiversity, biocomplexity, and vertebrate reproduction.
4. The role of exotic species in ecosystem diversity and complexity, and possible management methods should continue to be investigated.
5. The rehydration of the Rotenberger area is extremely important to study and to document effects. Nutrient enrichment is particularly an important factor, and the potential shift in species biodiversity resulting from nutrient enrichment needs more detailed study.
6. The Loxahatchee Impoundment Assessment (LILA) is an exciting and important project that should be continued.
7. Public involvement with the LILA should be increased during all phases of the study.
8. The overall objectives of the chapter, and the overall research plan should be made clear at the beginning of the chapter.
9. The editor for this chapter should ensure that the same format is used for reporting the results of each research project. Each project report should include objectives, relevance of the research to management or regulatory objectives, methods (including location and timing of the research), results, conclusions, implications for management or regulation.

CHAPTER 7: RECOVER ACTIVITIES

The panel noted progress made in the work by the RECOVER team in refining its objectives and in applying and evaluating scientific and technical information in support of the CERP. Overall this is a highly readable and understandable chapter. The summary section is excellent and clearly identifies responsibilities and sequencing of the work to monitor progress made in implementing the CERP. The overall purpose of this chapter is clearly stated in the RECOVER mission statement.

The panel also noted the effort to address the long-term and integrated nature of CERP by organizing the RECOVER mission into evaluation, assessment and planning / integration components. This implies the iterative and cyclical nature of the 30-year period for implementing the CERP, which is presented in a logical fashion in the RECOVER-WIDE section of the chapter.

A review of the system-wide performance measures for evaluating alternative plans (summarized in Appendix 7-1 and presented in http://www.evergladesplan.org/pm/recover/ret_perf_measures.cfm) indicates that at some point the Consolidated Report will likely have to address issues raised by employing these different evaluation models. While the panel did not undertake such an analysis, it is clear that parameters used could give rise to different conclusions from a management point of view as to what could be expected. The concern of the review panel is that applying the results of such models in a system-wide test may impact one of the principle purposes of the RECOVER program in being able to track each project. On the other hand the planning and integration objective could be strengthened in the long-term if consensus can be reached regarding the scientific and technical priorities for the CERP. The fact remains that management of complex areas is an inexact science and one where we must define long-term goals and strive in the general direction of such goals, even while meeting very specific scientific objectives (e.g., water quality measures; volume levels, etc.) the validity of which may change in a landscape level analysis. This is clearly acknowledged in the discussion of the adaptive management program on page 7-4. The RECOVER team should continue to report on the projects that are being tracked for CERP performance/compliance.

Progress reported on the development of the RECOVER-WIDE conceptual ecological model is noteworthy. This is precisely the type and scale of information needed for decision makers operating in the political arena. The challenge will be to identify and include more specific project results into landscape-scale models.

The panel notes the proposed timetable for implementing the monitoring and assessment plan of 2005 and supports the concept of presenting the results of this work in the Annual Report Card. The note that the 30-year implementation period of CERP will require an “integration function” and a “process to incorporate changing conditions, new information, and other factors that may affect CERP performance be put into proactive” should be greatly strengthened so that the public is fully aware that this is not a “silver bullet” solution to the problem of water management in South Florida. There is reason to build consensus and support for this fact overtime. The CERP update is a step in this direction, but the report must be put into a context and written in such a

way that the general public understands the implications of such an effort as well as the relationship between CERP and RECOVER.

The panel continues to 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 management actions. Further the panel continues to support the concept that 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, although the panel noted progress in data analysis during this reporting period.

There are still a number of unanswered questions that at some point will have to be addressed by the District. For example, 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 institutional implications of the third RECOVER objective – consensus building - noted in the 2002 and 2003 Consolidated Reports continues to be critical to acceptance by the general public to future management of the region. This should be given priority from the outset so as to catalyze joint ownership of the program, between the agencies and the public.

The CERP Annual Report Card continues to be 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.

CHAPTER 8A: ACHIEVING LONG-TERM WATER QUALITY GOALS

The panel noted progress made to date in achieving reduced TP levels in water discharged into the EPA as required by December 31, 2006 by the Everglades Forever Act. The panel also noted that the best management practices implemented in the Everglades Agricultural Area and the impact of the Stormwater Treatment Areas have had a positive and measurable outcome in terms of reducing μg/L loads into the Everglades system. Specifically, the panel noted that the estimate of 35 μg/L for long-term, flow-weighted mean of TP discharges from the Everglades Construction Project, once all STAs are operational, into the EPA exceeds the interim goal of 50 μg/L specified in the Everglades Forever Act.

The decision by the Florida Legislature to accept the Long-Term Plan for Achieving Water Quality in the EPA as developed by the State and District, and the result of amending the 1994 Everglades Forever Act is a very positive indicator as to the level of confidence in the potential of BMPs and STAs to contribute to overall water quality as well as a vote of confidence in the science being undertaken and applied. The panel also notes the importance of these results in terms of the overall CERP goals. A review of the Long-Term Plan does raise the issue of monitoring as a way of gathering new data and improving the Plan itself. Sections 5 "PDE" and 8 "Operation, Maintenance and Monitoring" of the Long-Term Plan address the operational aspects of monitoring progress towards attaining water quality goals, but does not provide the level of detail as to how such information will be treated either legally or scientifically in the opinion of the review panel. Therefore, the panel is not clear as to how the various monitoring efforts will be coordinated and how comparable the data will be from the various research efforts once the District begins examining data on a system-wide level.

The panel notes the importance of the statement that "The Basin-Specific Feasibility Studies were a fact finding exercise…not intended to define the final arrangement, location, and character of water quality improvement strategies in the various basins" (8A-3). It is particularly important that decision makers and the general public understand the experimental nature of this work, so as to minimize future conflict, should additional investments be required and/or structures removed, etc.

In terms of the Long-Term Plan for achieving water quality goals, it is also important that the District Governing Board "acknowledged the value and need for widespread public and interagency review…" (8A-4). The panel reacted positively to the discussion of some aspects of the Long-Term Plan in the 2004 Draft Consolidated Report.

The "adaptive implementation" strategy discussed in the Storm Water Treatment Area Optimization and Advanced Treatment Technology Research section of chapter 8A is logical and should be stressed as an effective tool for decision makers to accommodate new scientific information into the CERP process. The strategies for improving water quality in the basins identified (BMPs, STAs and WCAs) 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 as proposed

by the District. The complexity of trying to understand the complexity of these actions and particularly monitoring responsibilities and furthermore adapting the measures and models employed is of concern to the panel.

The panel notes the very detailed written comments on the plan and specifically this chapter, by the U.S. National Park Service, as well as their comments during the public meeting. However, the panel is somewhat concerned that some stakeholders seem to indicate that all discharges from the STAs should meet the P criterion of 10 μg/L at the point of discharge and not include the mixing effect to reducing P concentration levels from the point of discharge to the point where the water enters the EPA. The panel understands that P levels will vary due to a combination of BMPs, STAs, and natural mixing, and further supports the concept that water quality at the point it enters the EPA is the goal, not that water throughout the system meet the criterion from the point it is discharged from the EAA or any other point as water flows south through the system. Implementation of the Long-Term Plan implies an iterative learning and adaptation process over time that will meet P criterion within the established timeframe. The District should therefore aim to make measurable progress in the direction that the EFA mandates as a management goal at the landscape level.

The panel notes the limited tree planting efforts undertaken to date, undertaken with the support of the Marshall Foundation, and encourages the District to continue to explore the potential impact of this BMP in targeted areas where it might have a measurable impact on P uptake/concentrations.

CHAPTER 8B: THE EVERGLADES STORMWATER PROGRAM

The chapter is well written and actually leaves very few questions for the reader. The supporting tables are also adequately explained. Once again the panel is particularly pleased to note the District's efforts to expand public outreach and education tools for the CERP and ESP (non ECP permit areas) programs as part of a coordinated plan to achieve the goals of the Everglades Forever Act. Table 8B-2 provides useful information in this regard not reported in previous year's reports.

We also note the expanded BMP program as part of the cooperative agreements within the C-139, L-28 and the Feeder Canal basins and particularly the efforts to encourage local stakeholders to develop and implement BMPs in the C-11 West, the North River Canal, the North Springs Improvement District and the Wellington/ACME B basins (although overtime the latter will be diverted for treatment before release into the EPA). However, the Wellington and Feeder Canal basins continue to exceed TP goals by a sizeable factor, not to mention the very high levels from the Boynton Farms that were analyzed. The panel notes mention during the public hearing of the possibility of purchasing Boynton Farms as a means of controlling the high TP discharges.

The panel notes the District's program to continue to improve monitoring programs, particularly in water quality "hot spots" as well as its 10-step monitoring and regulatory action strategy. The panel agrees with the District that the comparisons of water quality data from non-ECP structures with State standards supports the contention that the District is making progress in compiling a data base which, overtime, will allow a serious analysis of compliance success with State water quality standards. Data collected to this point indicate progress but are not considered sufficient to determine more than general trends even for TP loads.

CHAPTER 8C: LAND ACQUISITION IN SUPPORT OF PROJECTS IN THE EVERGLADES REGION

No particular comment or questions on this chapter. Progress made in acquiring critical parcels of land were noted by the panel.

CHAPTER 8D: MANAGING FISCAL RESOURCES

In general terms the organization of this chapter by sources of revenue helps clarify the very complex issues related to both source and object of expenditure. Together with chapter 1, the present chapter provides a very good overview of the challenge confronting the District, the proposed plan and both the sources of revenue and proposed expenditure by program. The panel also felt that the introduction to this chapter notes two very important issues: the format for reporting financial information for the Everglades Trust Fund, and the comment that a dedicated funding source being essential if the restoration program is to be completed.

The panel also notes the progressive nature of tax incentives provided to both the agricultural sector and private individuals for meeting major milestones and/or paying taxes in a timely manner. These types of incentives should continued to be explored as a means to provide the District with as clear a picture of expected revenues as early as is possible in the fiscal year.

Finally, the panel supports the diagrams presented in this chapter presenting summary information in a clear and concise manner.

CHAPTER 8E: EXOTIC SPECIES IN THE EVERGLADES PROTECTION AREA

This chapter deals with a broad topic of invasive exotic species and their control in the Everglades Protection Area (EPA). This chapter indicates that basic research in controlling exotic plants has been underway for sometime. However, is there sufficient funding included in the Long-Term Plan to address some of the more complex questions including the management of plant and animal exotics? It seems logical that a substantial increase in the research effort is also warranted in the STAs given the changing water regime in these areas and the fact that they connect directly into the EPA. What priority has been assigned to this issue? Public education and support in the control of exotics will be vital. Is the Governing Board of the District supportive of this need?

Exotic species are obviously spread during hurricanes and flooding as well as by fires. Is there any research being conducted on these issues currently? Are there measures that can be taken after such an event to minimize long-term impacts and reduce loosing ground each time a flood or other disaster occurs? The NEWTT Assessment will provide a platform of data to assist managers in the control of exotic plants. Similar effort for animals (NEATT) should also be addressed.

Biological control of weeds or invasive exotic species is cost-effective, environmentally safe (if conducted properly) and self-sustaining. The use of weevils as biological control agents against aquatic and terrestrial weeds has been demonstrated to be highly successful in many instances in North America and throughout the world. Although biological control is a preferred alternative, this chapter should address the balance between biological and chemical controls on the strategy of exotic species control in the EPA.

The increased diversity of introduced and native species increases the complexity and difficulty of environmental impact assessment on exotic species. In other words, the tasks of exotic species control in Everglades require dedicated effort and expertise.

There are a lot of information and resources included in the chapter. The presentation should be in a more specific manner. For example what are the current official regulatory structure and responsibility of the exotic species control in the EPA? What are the current needs and knowledge gaps?

Without question issues surrounding management of exotic plant and animal species continue to be of concern to the review panel. In a general sense the problem is understood, but the complexity and cost of proposed solutions is still not fully understood. And as the hydrology regimen and water quality questions are dealt with, managing exotics becomes even more complex, such are the potential interactions of non-indigenous plants and animals with native species.

The panel is convinced that the District's efforts to sort out and apply selected control measures are satisfactory. In fact, incremental and what may appear to be isolated management measures are the only logical way to proceed, given the degree of uncertainty as to the long-term implications of large investments at the landscape scale.

Redefining research priorities in terms of the management of exotics will continue to be critical to the long-term environmental quality of South Florida, particularly within the context of CERP goals. In the opinion of the panel, the District Governing Board should assign a higher priority to funding an expanded research program as it is certain that with implementation of the STAs and the CERP, the hydrology of the region will change with unknown impacts on both native and non-native plants and animals. In addition, changing agricultural and urban development patterns, intensity and technologies for dealing with the nutrient rich runoff and other effluents will also have many undesirable and unpredictable impacts on the EPA as well as the STAs and surrounding areas.

The review panel has endorsed the aim of a comprehensive invasive plant and animal management program since the 2000 Consolidated Report review process. As financial resources are limited, assigning priority to plant research understandable, but in the not too distant future a concerted effort to better understand exotic animals is mandatory if a comprehensive program is to become a reality. The panel understands and endorses the concept that continual investment will be required to keep exotics under control.

Summary

This chapter addresses the current situation, knowledge gaps and future research needs of exotic species control in the EPA. The increased diversity of introduced and native species increases the complexity and difficulty of environmental impact assessment on exotic species. Measures of biological, chemical and mechanical control have been applied to control the exotic species in EPA. A lot of information concerning the exotic species control, especially plants, is included. Little is mentioned about the animal aspect of the issue. Vague official regulatory responsibility and the existing knowledge gaps are identified as the two critical elements needed to be addressed in order to improve the efficiency and results of the exotic species control in the EPA.

Recommendations

1. There are a lot of information and resources included in the chapter. The presentation should be in a more specific and factual (not just conceptual) manner.
2. The NEWTT Assessment will provide a platform of data to assist managers in the control of exotic plants. Similar effort for exotic animals (NEATT) should also be addressed.
3. Justification for using biological, chemical or mechanical control of exotic species should also be discussed.

CHAPTER 8F: THE LOWER EAST COAST REGINAL WATER SUPPLY PLAN

The panel supports the concepts of water reservation for natural systems (fish and wildlife), as well as health and human safety. It also notes the approval of the white paper "Water Resource Protection Strategies for the Implementation of CERP under Federal and State Law" by the District's Governing Board.

The panel notes the comprehensive nature of the presentation during the public hearing and requests that more detail be included in the 2005 ECR.