A Review of

"Alafia River Minimum Flows and Levels Freshwater Segment including Lithia and Buckhorn Springs"

March 21, 2005 Draft

and

"Proposed Minimum Flows and Levels for the Upper Segment of the Myakka River, from Myakka City to SR72"

August 10, 2005 Draft

by

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EXECUTIVE SUMMARY

This is a summary of the Scientific Peer Review Panel's ("Panel") evaluation of the scientific and technical data, assumptions, and methodologies used by the Southwest Florida Water Management District (District) in the development of two proposed minimum flows and levels (MFLs): the Alafia River freshwater segment including Lithia and Buckhorn Springs ("Alafia Report," SWFWMD 2005b) and the Myakka River upper segment from Myakka City to SR 72 ("Myakka Report", SWFWMD 2005c).

The Peer Review Panel has attempted to provide a critical review of the methods, data, and conclusions of the District. Overall, the Panel endorses the District's approach for setting MFLs in the Alafia and Myakka rivers, and we find no serious flaws or errors in the methodology or findings documented in the reports. Assumptions of the approach are well documented and are reasonable given the amount and quality of data available. Tools and methods of analysis employed in this effort are appropriately used and utilize best available information. Conclusions in the reports are based on an impressive field data collection effort and sound application of findings from the scientific literature and previous investigations by District staff. The District has done a commendable job of incorporating the suggestions of past peer review, including those for the Upper and Middle Peace River MFLs (Gore et al. 2002, Shaw et al. 2005), including use of seasonal building blocks and the application of the Instream Flow Incremental Methodology. The District has also continued to apply and refine several concepts that were endorsed by previous peer review panels (Gore et al. 2002; Shaw et al. 2004). The Panel has provided suggestions for relatively minor changes or additions to the reports for the Alafia and Myakka rivers that we feel will improve the repeatability of the methods, better justify the conclusions and ensure that resource protection goals are satisfied for overlooked species or unusual flow conditions.

The Panel finds particular merit with and strongly endorses several concepts incorporated in the Alafia and Myakka River MFLs. These include:

- Identifying ***benchmark periods*** based on different phases of the Atlantic Multidecadal Oscillation (AMO) for identifying the most protective minimum flows
- Applying ***multiple, independent approaches*** to identify the most protective minimum flows in each seasonal block
- Specifying minimum flows in terms of allowable ***percent flow reductions*** that vary by season and flow conditions

The Panel recommends that the District continue to refine these concepts and that they should routinely be incorporated when setting future MFLs for rivers in Southwest Florida.

The draft report for setting MFLs for the Alafia River includes the first effort by the SWFWMD to set MFLs for major springs in a basin, Lithia and Buckhorn springs. The panel expressed concern regarding the District's decision to use for these springs only one of the methods employed to develop allowable flow reductions for the rivers and to

set a single flow reduction for the entire year instead of for the three seasonal blocks that were used for the rivers. The panel recognizes the logic of using an annual standard, but noted that there is substantial interannual variability in the discharge from both springs and that there may be merit in reducing permitted withdrawals from the springs in times of lower discharge. The panel suggests that thought be given to more restrictive withdrawals when the springs are discharging at less that 20% of long-term annual means. Although the panel supports the extension of PHABSIM and other riverine instream flow methods to spring systems, we recommend that the District research and consider alternative approaches for setting MFLs in Lithia and other major Floridan Aquifer springs that focus on the unique aquatic habitat provided by these systems. The review team supports the decision by the District to defer setting a prescribed flow reduction for Lithia Springs until MFLs for the Alafia estuary are developed.

The sole modification made to the District's basic MFL approach to deal with the issue of agricultural flow augmentation in the Myakka River was to employ a single benchmark period instead of two periods as was done for the Alafia River. The panel supports this modification and believes it to be reasonable and consistent with the District's overall approach. However, it should be noted that this approach does little to prevent flows from being augmented above natural background levels, nor does it correct the current flow augmentation problem in the watershed. Setting MFLs also may require that historic minimum flows be retained in intact rivers or returned in rivers with significant flow augmentation.

We applaud the District's commitment to periodic reassessment of the MFLs for the Alafia and Myakka rivers and other water bodies as structural alterations or changes in watershed conditions occur. We strongly recommend, however, that the District begin now to develop the process and methodology by which such reassessment would occur, and we suggest that such a process should be based on an adaptive management framework.

INTRODUCTION

The Southwest Florida Water Management District (SWFWMD) under Florida statutes provides for peer review of methodologies and studies that address the management of water resources within the jurisdiction of the District. The SWFWMD has been directed to establish minimum flows and levels (designated as MFLs) for priority water bodies within its boundaries. This directive is by virtue of SWFWMD's obligation to permit consumptive use of water and a legislative mandate to protect water resources from *significant harm*. According to the Water Resources Act of 1972, *minimum flows* are defined as "the minimum flow for a given watercourse shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area" (Section 373.042 F.S.). A *minimum level* is defined as "the level of groundwater in an aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area." Statutes provide that MFLs shall be calculated using the *best available* information.

The process of analyzing minimum flows and levels for the Alafia and Myakka rivers is built upon the analyses previously performed on the Upper Peace River (SWFWMD 2002), peer reviewed by Gore et al. (2002), and more recently, on the Middle Peace River (SWFWMD, 2005a), peer reviewed by Shaw et al. (2005). The Alafia and Myakka MFL methodologies incorporate many of the recommendations of these earlier peer reviews, as well as key improvements developed by District staff. Establishment of minimum flows and levels generally is designed to define thresholds at which further withdrawals would produce significant harm to existing water resources and ecological conditions if these thresholds were exceeded in the future.

This review follows the organization of the Charge to the Peer Review Panel and the structure of the draft report. It is the job of the Peer Review Panel to assess the strengths and weaknesses of the overall approach, its conclusions, and recommendations. This review is provided to the District with our encouragement to continue to enhance the scientific basis that is firmly established for the decision-making process by the SWFWMD. Combined comments and recommendations are given for the basic approach for analyzing and setting MFLs in both rivers, followed by separate comments on aspects unique to each river; i.e., approaches for setting MFLs for springs in the Alafia River and for dealing with agricultural flow augmentation that occurs in the Myakka River. Extensive editorial comments and suggestions to improve the draft reports on the Alafia and Myakka rivers are provided in the Appendices.

1.0 THE CHARGE

The charge to the Peer Review Panel contains five basic requirements:

1. Review the District's draft documents used to develop provisional minimum levels and flows for the Alafia and Myakka rivers.
2. Review documents and other materials supporting the concepts and data presented in the draft document.
3. Participate in an open (public) meeting at the District's Tampa Service Office for the purpose of discussing directly all issues and concerns regarding the draft report with a goal of developing this report.
4. Provide to the District a written report that includes a review of the data, methodologies, analyses, and conclusions outlined in the draft report.
5. Render follow-up services where required.

We understand that some statutory constraints and conditions affect the District's development of MLFs and that the Governing Board may have also established certain assumptions, conditions and legal and policy interpretations. These *givens* include:

1. the selection of water bodies or aquifers for which minimum levels have initially been set;

2. the determination of the baseline from which "significant harm" is to be determined by the reviewers;
3. the definition of what constitutes "significant harm" to the water resources or ecology of the area;

4. the consideration given to changes and structural alterations to watersheds, surface waters, and aquifers, and the effects and constraints that such changes or alterations have had or placed on the hydrology of a given watershed, surface water, or aquifer; and
5. the adopted method for establishing MFLs for other water bodies and aquifers.

In addition to the draft report and appendices, various types of supplementary data provided by the District also were examined as part of this review.

2.0 RESULTS OF THE PEER REVIEW

2.1 Common Approach for Setting MFLs for Alafia and Myakka Rivers

MFL Benchmarks and Resource Protection Goals

Benchmarks and the Atlantic Multidecadal Oscillation (AMO)

The reports use the five elements listed by Beecher (1990) as guidelines for developing minimum flows and levels (MFLs). These are a good set of guidelines. One guideline, the use of a benchmark period, needs to be coupled to the growing understanding of climate variability, the AMO, and river flow regimes in Florida. The draft report by Kelly (SWFWMD 2004) does an excellent job in demonstrating how various benchmark periods can yield very different answers with regards to flow regime when the AMO is in different modes. The analysis of AMO and streamflow relationships for Florida (SWFWMD 2004) was previously peer reviewed and the findings of the draft report were strongly endorsed by the reviewers (Shaw et al. 2004). In Florida, the status of the AMO needs to be considered when MFLs are being set, especially given the strong influence of the AMO on streamflow patterns, and when regulatory and other measures are being considered to sustain adequate flows and levels (Enfield et al. 2001). The District has fully embraced the climate-streamflow issue in developing the MFLs for the Alafia and Myakka rivers by evaluating and identifying limiting flow conditions for two separate benchmark periods (based on different phases of the AMO) for each approach described in the report. Recommended low-flow thresholds and percent flow reduction criteria are based on the most limiting of these benchmark periods to ensure adequate protection during periods when less rainfall and lower streamflow prevail. The peer review panel strongly endorses this approach and recommends that similar approaches should routinely be incorporated when setting MFLs for all rivers in Florida. In addition, knowledge of

AMO-streamflow relationships gained by District staff should be widely disseminated to water managers throughout Florida and other parts of the eastern United States.

For the Alafia, the report provides convincing evidence (using water quality data and comparison of median daily flow hydrographs from different sub-basins on a flow per unit watershed area basis) that flow increases in low to median flows around 1960 were caused by increases in mining related discharges. Subsequent decreases in the same range of flows in the 1970s were attributed to a combination of curtailment of mining discharges and climate. This is similar to arguments made regarding the hydrologic effects of climate vs. mining in the middle Peace River basin (SWFWMD 2005a). One minor omission in the discussion of flow trends is a statement regarding whether increasing trends detected in the discharge of Lithia and Buckhorn springs are consistent with the expected effects of the AMO.

In the Myakka Report, convincing evidence is presented that dry season (low to median) and mean annual flows on the Myakka River have increased substantially since the late 1970s and that this trend is not caused by climate but instead by increases in discharge (irrigation return flows and runoff) from agricultural operations near the headwaters. Additional studies of agricultural flow augmentation in the Flatford Swamp area are cited to support this inference. The District's decision to determine minimum flows and levels in the Myakka River based only on the 1940-69 benchmark period (the period unaffected by agricultural flow augmentation) is reasonable and prudent given the inability to precisely quantify flow augmentation effects and separate them from effects caused by AMO-induced climate cycles. For a water body that naturally experiences no-flow conditions during the dry season, we consider this approach adequately protective even though the benchmark period selected represents the wetter phase of the AMO for southern rivers like the Myakka.

Building Block Approach

The SWFWMD has employed a building block approach in establishing MFLs for the Alafia and Myakka rivers (Gore et al. 2002, Postel and Richter 2003). The assumptions behind building block methods are based upon simple ecological theory. Organisms and communities occupying a river have evolved and adapted their life cycles to flow conditions over a long period of pre-development history (Stanford et al. 1996, Bunn and Arthington 2002). Thus, with limited biological knowledge of specific flow requirements, the best alternative is to maintain or recreate the hydrological conditions under which communities had existed prior to disturbance of the flow regime or allocation of instream flows. Building-block models are the "first-best-approximation" of adequate conditions to meet ecological needs. More often than not, resource agencies have hydrographic records for long periods of time, while little or no biological data are available.

Hydrological variability is the critical template for maintaining ecosystem integrity. The use of this natural variability as a guide for ecosystem management has been widely

advocated (e.g. Richter et al. 1996, Bunn and Arthington 2002). Although variability is a key to ecosystem maintenance, some sort of predictability of variation must be maintained. It must be realized that survival of aquatic communities is contained within the envelope of natural variability (Resh et al. 1988). In addition to the seasonal pattern of flow, such conditions as time, duration and intensity of extreme events, as well as the frequency and predictability of droughts and floods, may also be significant environmental cues. Also, the frequency, duration, and intensity of higher and lower flows can affect channel morphology and riparian vegetation, and thus change aquatic habitat. Indeed, the rate of change of these conditions must also be considered (Poff and Ward 1989, Davies et al. 1994, Richter et al. 1996, 1997).

Hydrological variability is a critical component of the flow regime, and three blocks are defined from the average long-term annual hydrograph. Block 1 considers the low flow period that occurs during the spring dry season, Block 2 considers the baseflow period during the cooler portion of the year when evapotranspiration rates are often at their lowest levels, and Block 3 considers the high flow period during the summer/fall wet season. This is a valid approach for setting MFLs because it accounts for expected seasonal variability during a typical year. By contrast, MFLs focused solely upon low flow conditions are inadequate for protecting important river and riparian ecosystem functions that occur at other times of the year, and which are often critical to the viability of aquatic organisms. The building block approach is based upon predictably varying hydrological conditions and is a rigorous and defensible approach for the establishment of protective MFLs for the Alafia and Myakka rivers. It also has the advantage of insuring a flow regime with the range of variability essential to the maintenance of stream and river structure and function.

One potential weakness of using building blocks with fixed beginning and ending dates that was identified in the peer review for the Middle Peace River is that some important ecosystem functions may receive inadequate protection if an atypical or unusual water year occurs (Shaw et al. 2005). For example, during strong El Niño cycles, Florida often receives more intense rains and higher stream flows during the winter and spring months, which are assumed to be low-flow periods according to the building block concept. Conversely, less than average rainfall and stream flow may occur during the summer. This can result in an annual hydrograph that is seasonally reversed from the pattern assumed by the District's building blocks. In response to this concern, District staff have modified the building block approach so that the low flow threshold applies throughout the year instead of only during the low flow period (Block 1). This improvement is incorporated in the building block approach for both the Alafia River and Myakka River MFLs.

Preventing Significant Harm – 15% Change in Habitat

The draft Alafia and Myakka reports continue the District's practice of using a 15% change in habitat availability as the threshold for defining significant harm. This value was originally chosen based on the peer review report by Gore et al. (2002) for MFLs for

the Upper Peace River (SWFWMD 2002) and, strictly speaking, applied to common professional practice when interpreting the results of PHABSIM analyses. The application of the 15% change threshold was expanded somewhat in the District's report on the Middle Peace River MFLs to define significant harm as either a 15% change in the area of available habitat (spatial change) or a 15% change in the number of days habitat is accessible to fish and other aquatic organisms (temporal change) (SWFWMD 2005a). This expanded interpretation also is used for the Alafia River and Myakka River MFLs. It should be acknowledged, however, that a 15% change in habitat availability based on a reduction in spatial extent of habitat (as was used in the PHABSIM analyses) may not be equivalent to a 15% change in temporal availability of habitat, and it is recommended that this issue be more fully investigated in the future. Nevertheless, the peer review panel for the Middle Peace found that use of the 15% threshold is reasonable and prudent (Shaw et al. 2005), especially given the absence of clear guidance in statute or in the scientific literature on levels of change that would constitute significant harm. We acknowledge that percentage changes reported in the literature have ranged from 10-33% in other applications designed to prevent significant harm. The present panel affirms the use of the 15% threshold in the Alafia and Myakka rivers for similar reasons. However, over the long term, it is critical that this presumption be further investigated and validated and/or refined through the collection of additional site-specific data as part of a larger adaptive management program.

Analytical Tools Used to Develop MFLs

HEC-RAS

The Hydrologic Engineering Centers River Analysis System (HEC-RAS) model is used for estimating one-dimensional steady-state water surface profiles in setting MFLs for the Alafia and Myakka rivers. HEC-RAS is a model developed by the US Army Corps of Engineers Hydrologic Engineering Center and is widely used, having previously replaced the HEC-2 model as the standard program for water surface profile calculations. The newest generation of the model (version 3.1.1) was used with a range of flows from the USGS stream flow gages to determine stage versus flow and wetted perimeter versus flow for numerous cross sections on the Alafia and Myakka rivers. This model has a history of being used to estimate minimum flows (Gore and Mead 2002).

The HEC-RAS model also was used in establishing MFLs for the Upper Peace (SWFWMD 2002). The concern expressed in the peer review of the Upper Peace report was that the hydraulic model needed to be linked to a biotic habitat model. This has been done with subsequent riverine MFLs, including the Alafia and Myakka, by use of the Physical Habitat Simulation (PHABSIM) model with key biota from these rivers, and is also used in the fish passage and wetted perimeter analysis and with RALPH analyses of woody habitat and floodplain plant communities. This is an appropriate linking of models and makes for a more robust determination of MFLs.

The peer review panel deems the HEC-RAS model to be an appropriate tool for assessing flow-stage relationships in the Alafia and Myakka rivers. Some problems were

encountered when applying the model to cross-sections that did not extend sufficiently far into the floodplain to handle wet season flows, but it appears that these issues were handled appropriately. A more thorough discussion of precision and accuracy issues related to the use of HEC-RAS and the methods of determining cross section elevations is provided in the Myakka Report, perhaps in response to peer review suggestions for the middle Peace report. We recommend that similar discussion be added to the Alafia Report. We support the District's intent to further validate the accuracy of models and the effectiveness of its MFLs by investigating inundation of floodplain wetlands along river corridors where MFLs have been established.

PHABSIM

The Instream Flow Incremental Methodology (IFIM) (Bovee et al. 1998) and its software, the Physical Habitat Simulation (PHABSIM) requires hydrological data plus the additional effort of determining the physical habitat requirements of target biota. There are five major hydraulic conditions that affect the distribution and ecological success of riverine biota. These are suspended load, bedload movement, turbulence, velocity profile, and substratum interactions (near bed hydraulics). Singly, or in combination, changes in these conditions can alter distribution of biota and disrupt community structure. The interactions of these hydraulic conditions upon the morphology and behavior of the individual organisms govern the distribution of aquatic biota. The IFIM attempts to describe these interactions using a relatively simple but appropriate modeling technique.

Traditionally, the IFIM technique has focused on habitat availability of target fish species. Gore and Nestler (1988) believe that habitat suitability curves can be thought of as surrogates for basic niches. Statzner et al. (1988) and Gore and Bryant (1990) have demonstrated that different macroinvertebrate life stages also require different hydraulic conditions to achieve completion of life cycles, just as fish species have very different spawning, incubation, and maintenance requirements. Recently, Gore et al. (2001) demonstrated that inclusion of macroinvertebrate criteria often dramatically altered decisions on flow allocations versus those based upon analysis of fish species alone. By the same token, we recommend that the District evaluate whether additional habitat suitability curves should be developed and PHABSIM analyses be conducted for other species that may be more sensitive to hydrological change than the three common centrarchid fishes identified in the Middle Peace report. These other species might include key invertebrates in the rivers of the District.

Changes in velocity distribution and substrate/cover characteristics at regular intervals, combined with stage/discharge relationships, provide the calibration data for PHABSIM. Habitat suitability curves were developed for spotted sunfish (*Lepomis punctatus*), largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), and macroinvertebrate community diversity (Gore et al. 2001, Stuber et al. 1982). These are appropriate species for consideration in rivers of the southern Florida peninsula and their selection is validated by data presented on fish abundance in the appendices to the MFL reports. Helpful information on the methods used for aquatic invertebrate and fish community assessment was included in Chapter 4 of the Alafia report, but was absent from the Myakka report. It is not clear whether such assessments were only conducted for the

Alafia or whether the same assessments were carried out for the Myakka but the information was left out of the Myakka report. The need for continued development and refinement of habitat suitability curves for these species and other species of concern remains a necessary long-term goal (as noted below), but the peer review panel affirms that the best available information was used in the PHABSIM modeling for the Alafia and Myakka rivers. This strengthens the specific recommendations for MFLs made in the report.

Over the long term, we recommend that the District focus research on evaluating and potentially developing habitat suitability information on additional species or groups of species that may be more sensitive to changes in hydrological regimes. Of particular concern would be any listed, imperiled, or endemic species, species tracked by the Florida Natural Areas Inventory (FNAI) (e.g., ironcolor shiner, present in both the Alafia and upper Myakka rivers), wading birds and fish species with preferences for stream edges or banks that might be the first places to feel the effects of reduced flows. Similarly, it may be useful to develop better habitat suitability information for certain exotic species present in these rivers (e.g., blue tilapia (*Oreochromis aureus*)) to ensure that reduced flows do not *improve* habitat conditions for such species or facilitate their invasion of new habitat. Additional species of concern in the Alafia and Myakka rivers that may not be directly amenable to the PHABSIM approach include several species of rare plants inhabiting the floodplain (FNAI Element Occurrence Database, 2005).

RALPH PLOTS AND ANALYSES

Recent and Long-Term Positional Hydrographs (RALPH) plots and analyses were used in the reports to identify the number of days from a defined period of record when flows or levels associated with a specific aquatic habitat or floodplain feature were equaled or exceeded. These analyses were applied at various river cross-sections and enable a quantitative assessment of how flow reductions of a certain magnitude would affect the number of days that certain flow characteristics would be met or exceeded. Examples are given in the reports. As a means of analysis and graphical visualization, the panel feels that the RALPH plots are an important enhancement to the presentation of MFLs for riverine systems, and we recommend that the District continue to utilize and refine this tool for future MFL development.

Habitat Criteria and Characterization Methods Used to Develop MFLs

FISH PASSAGE

Fish passage was used to estimate flows sufficient to permit fish movement throughout the Alafia and Myakka rivers. Flows of this magnitude would also likely permit recreation (i.e., canoeing). A fish passage criterion of 0.6 ft was used based in part on size data from large-bodied fishes in Florida streams and minimum fish passage depths used in other instream flow settings elsewhere in the U.S. This criterion has been used to

develop previous minimum flow plans (SWFWMD 2002) and has been found acceptable by peer reviewers (Gore et al. 2002).

This notwithstanding, fish passage depths in the range of 0.5-0.8 ft were originally derived from requirements of migratory salmonids in cool, well oxygenated waters of the western U.S. The adequacy of these standards for use in Florida's warmwater streams has been questioned by resource managers (HSW Engineering, Inc. 2004). Although no definitive research has yet been conducted on this issue (Hill and Cichra 2002), it is the emerging consensus that minimum depth criteria used in Florida need to be re-evaluated to ensure that they adequately prevent negative effects associated with low flows in warmwater ecosystems, including high water temperatures, low dissolved oxygen, algal blooms and increased predatory pressure, in addition to mere physical passage of fish. The peer review panel recommends that the District engage with researchers studying fish passage depths for warmwater streams and actively work to develop minimum fish passage criteria that are more suitable for warmwater aquatic ecosystems, and which go beyond the issue of simple physical passage to address other negative impacts of low flows.

Flows adequate to maintain the fish passage criterion were estimated at stream cross sections using output from the HEC-RAS model. Water depth at the deepest part of the channel was used to establish the criterion. The peer review panel feels that the continued use of the 0.6-ft standard represents best available information and is reasonable and consistent with overall SWFWMD water allocation policy. However, the use of river stages estimated using HEC-RAS, which the authors of the Myakka Report acknowledge as having a calibration accuracy of ± 0.5 ft., in combination with a fish passage criterion of 0.6 ft and linear regressions between modeled stages and flows, raises questions regarding the level of uncertainty that exists in the derived low-flow prescriptions.

As a final note, one of the water resource functions that the low-flow prescriptions are intended to protect is recreational use of the river. This goal is alluded to in Section 3.3.1 of both reports, but the issue is never discussed or developed further. Apparently, the assumption is made that fish passage criteria serve as surrogates for recreational use. While the panel feels that 0.6 ft is most likely an adequate depth that will permit canoeing during low flow periods, this issue and discussion of appropriate minimum depth criteria should be further developed. If it is being assumed that recreation is mostly passive (e.g., canoeing) and that the low flow threshold based on fish passage or wetted perimeter analysis will also protect flows and levels for recreation, then this should be explicitly stated and justified in the report. The justification, if possible, should cite figures on boating usage, minimum depths and widths needed for safe and enjoyable passage of canoes or other craft and include analysis demonstrating that those conditions would be satisfied by the proposed low flow thresholds.

DAYS OF FLOODPLAIN INUNDATION

Low gradient rivers, like the Alafia and (especially) the Myakka, have extensive floodplains. Floodplains support complex and diverse plant communities, whose distribution is determined by small changes in microtopography and average length of annual inundation or hydroperiod. Plant communities are often adapted to the average annual flow regime and decline if flood frequency is altered. Extensive floodplains are often critical to many forms of aquatic life. River biota migrate onto floodplains for foraging and spawning during floods. In addition, periodic flooding stimulates biogeochemical transformations in floodplain soils, which benefit both floodplain and riverine productivity.

The District has recognized the critical role of floods in proposing minimum flows for the Alafia and Myakka rivers. Extensive vegetation and elevation surveys were used to characterize the structure and floristic composition of floodplains. HEC-RAS and RALPH plots/analysis were used to determine floodplain inundation patterns based on historical benchmark periods. This information was then used to estimate percent of flow reductions for Block 3 that would result in no more than a 15% reduction in the number of days of floodplain inundation. The analysis suggested that a stepped approach to water allocation during Block 3 would meet the established criteria.

The peer review panel feels that consideration of high flows and patterns of floodplain inundation is commendable. The use of a 15% reduction in the number of days of inundation is an appropriate criterion for water allocation and is consistent with the working definition of significant harm used throughout the report.

Inclusion of information on the methods used for identifying and characterizing floodplain plant communities and soils in the Alafia and Myakka reports is helpful and represents a significant improvement in the readability of these reports and interpretation of results. We commend District staff for incorporating these and other changes, which were recommended in previous peer reviews, in these reports.

SNAG AND ROOT INUNDATION

Woody substrates (snags and exposed roots) are a critical habitat in most low gradient southeastern streams. Woody substrates are often the most productive habitat (on a unit area basis). Wood also provides shelter for freshwater fishes and basking sites for aquatic herpetofauna. Submerged wood also is important in biogeochemical transformation because biofilms develop on submerged wood, carbon and nutrient processing are enhanced and overall stream metabolism is increased.

The District estimated the mean elevation of woody substrates using instream habitat cross-sections in the Alafia and Myakka rivers. Then, an estimate of the average frequency of inundation was determined using the two benchmark periods. Data from the most recent period (1970-1999) were used because it was more conservative (i.e., it was

during a period of lower stream flow). This was compared with previously prescribed flow reductions in Blocks 1 and 3 to determine the overall effect on woody substrate inundation. These analyses were used to help determine the allowable flow allocation during Block 2 and then estimate flow allocations that would result in no more than a 15% reduction in days of inundation over the entire year.

The peer review panel agrees with the District that woody substrates are a critical habitat in the Alafia and Myakka rivers and that their duration of inundation should be considered in flow allocation strategies. The approach adopted by the District is reasonable and consistent with other recommendations made in the report.

COMPLIANCE STANDARDS AND PROPOSED MINIMUM FLOWS

The peer review panel endorses the District's proposed minimum flows for the Alafia and Myakka rivers and finds them to be based on sound science and best available information, subject to our comments and recommendations above. We believe that the consideration of two separate benchmark periods based on distinct climate regimes (at least for the Alafia) and multiple assessment methods and habitat criteria for identifying the limiting flow reductions in each seasonal block gives additional confidence in the District's work and lends credibility to the results. We recommend that a similar methodological framework be adopted for developing all future MFLs. We commend the District for specifying minimum flows in terms of allowable percent flow reductions for different seasonal blocks and a low-flow threshold applicable at all times of the year. This "percent of flow approach" (as it is called by instream flow analysts) combined with seasonal building blocks has been recognized as one of the best ways of protecting multiple functions and values of river systems under a wide range of flow conditions (Postel and Richter 2003). The proposed short and long-term compliance standards proposed in the report are pragmatic and logical means of implementing the findings of the report in a regulatory context.

The review panel does have a concern about the wording of the second short-term compliance standards for Block 2 and Block 3 of the draft Alafia River report. The wording for the short-term compliance standard for Block 1 reads "When flows are between 59 cfs and 66 cfs measured at the USGS Lithia Gage, all flows above 59 cfs are available for use." The wording for Block 2 states "All flows between 59 cfs and 64.2 cfs measured at the Lithia gage are available for use." The wording for Block 3 states "All flows between 59 cfs and 69 cfs measured at the Lithia gage are available for use." We believe that the present wording for the second short-term compliance standard for Block 2 and 3 could be construed to mean that all water can be extracted from the river when flows are between the stated ranges for Block 2 and Block 3. The wording for Block 1 is clearer. The panel suggests that the wording for Block 2 read "When flows are between 59 and 64.2 cfs measured at the USGS Lithia Gage, all flows above 59 cfs are available for use." Similarly, wording for Block 3 should read "When flows are between 59 cfs and 69 cfs measured at the USGS Lithia Gage, all flows above 59 cfs are available for use." This way of stating the standard would preclude confusion as to whether all the flow or

only part of the flow is available for reduction in these windows of river discharge. We also applaud the District's commitment to periodic reassessment of the MFLs for the Alafia and Myakka rivers and other water bodies as structural alterations or substantial changes in watershed conditions occur. We strongly recommend, however, that the District begin now to develop the process and methodology by which such reassessment would occur. Specifically, we recommend that an adaptive management framework be adopted for evaluating compliance with MFLs, taking corrective action to reduce water withdrawals and triggering MFL reassessments when necessary. Such a framework should include ongoing evaluation of the effectiveness of the MFLs based on long-term monitoring of key ecosystem and water resource values the MFLs are intended to protect and periodic assessment of whether key assumptions inherent in the MFL development are still satisfied.

2.2 Minimum Flows and Levels for Lithia and Buckhorn Springs

The draft report for setting MFLs for the Alafia River includes the first effort by the SWFWMD to set MFLs for major springs in a basin. In both cases, the head springs themselves are highly altered from natural conditions, with Lithia Springs serving as a recreational swimming facility and Buckhorn Springs as a water supply pumping facility. Consequently, the MFL approach for these systems focused on protecting the ecological resources of the spring runs (including Buckhorn Creek). Of the various methods employed for developing minimum flow prescriptions for the Alafia and other rivers (e.g., fish passage, snag and root inundation, wetted perimeter, PHABSIM), the decision was made, presumably on the basis of data availability, to apply only the PHABSIM methodology to the spring runs. The use of multiple corroborative methods for setting MFLs in streams is a strength of the District's overall approach, and the panel suggests that additional and more careful explanation is needed in the report to better justify employing only one of these methods to the spring systems, especially given the fact that the PHABSIM results for Lithia Springs are ultimately discounted.

Allowable prescribed flow reductions are to be set on an annual basis for Lithia Springs and Buckhorn Springs Main rather than for three designated blocks with different hydrological characteristics, as is done for the rivers. The review team recognizes the logic of using an annual standard, but there is substantial interannual variability in the discharge from both springs and there may be merit in reducing permitted withdrawals from the springs in times of lower discharge. For example, the range of daily discharges from Lithia Springs Major is 7 to 70 cfs and from 4 to 22 cfs for Buckhorn Springs Main during the period of available record. The review team suggests that thought be given to more restrictive withdrawals when the springs are discharging at less that 20% of long-term annual means. For springs with more constant flow regimes, there would be less of a need for a low discharge threshold at which to reduce withdrawals and a set annual percentage could be applied.

The decision was made to not develop a prescribed flow reduction for Lithia Springs Major at this time. This decision was based on the ongoing MFLs being developed by the District for the estuarine portion of the Alafia River. MFLs for the estuary may be

partially dependent on flows from Lithia Springs, and the review team supports the decision by the District to defer setting a prescribed flow reduction until the issue of setting MFLs for the Alafia estuary is resolved.

The panel also recommends that the District research and consider alternative approaches for setting MFLs in Lithia and other major Floridan Aquifer springs. Although we generally support the extension of PHABSIM and other methods for setting minimum flows in rivers to spring systems like Lithia, it should be recognized that springs are unique aquatic ecosystems that are quite different from the blackwater systems that otherwise prevail in Florida. For example, Odum's classic study of Silver Springs identified unique characteristics of the aquatic habitat of springs, including high water clarity and light penetration, high mass turnover rates and flow velocities and steady-state production, some of which might be affected by changes in spring flow (Odum, 1957). This unique environment, while perhaps not supporting a large number of rare or spring obligate species, may in fact provide physiological refuge or serve important habitat needs of more common species that goes beyond a simple stage-habitat relationship. One factor to consider in setting MFLs for springs is the frequency of incursion of riverine conditions (i.e., more highly colored water with different chemical, temperature and other properties) into portions of the spring and spring run habitat as spring flows are reduced. St. Johns Water Management District used the frequency and extent of incursions of cold river water into portions of the spring run utilized as winter habitat for manatee to assess its proposed MFL for Volusia Blue Spring. An analogous approach could be developed for springs in the SWFWMD, focusing on fish or invertebrate habitat, or in cases where ecological values are minimal, focusing on impacts to recreational use, water quality or aesthetics. It is not clear whether the manatee should be considered in setting an MFL for Lithia Springs. The report includes no discussion of whether this species presently or historically utilized the spring, despite the fact that a known manatee aggregation occurs at the TECO Big Bend power plant a short distance downstream.

Another possible factor to consider for springs that are heavily utilized for recreation is the relationship between depth of flow in the spring run and extent of trampling of submerged aquatic vegetation. Observations of springs in north Florida suggest that as water levels decline, damage to vegetation (and associated fauna such as snails) becomes more extensive as swimmers become waders and move into areas of the spring run previously too deep for wading. Such relationships are, for example, built into the limits on recreational use implemented at Ichetucknee Springs.

The percentage of maximum reduction of discharge for Buckhorn Springs Main is proposed as no more than a 15% reduction of mean daily flow from the average from the previous month (corrected for withdrawals). PHABSIM analyses were used to assess habitat changes from various flow reductions, and the analyses suggested a 15% flow reduction on average was most appropriate to meet a less than 15% reduction in habitat for various life history stages for dominant fish species in Buckhorn Creek downstream of the main spring. This is consistent with the criteria used in setting minimum flows and levels for rivers administered by the SWFWMD, and the review panel agrees that this is an appropriate target to use to meet the criteria of no significant harm to the spring and

creek. Again, there is significant month-to-month variability in spring discharge, and a reduced or no reduction policy might be considered for times when spring discharge is at the lower one or two deciles of mean annual long-term discharge.

2.3 Approach for Addressing Flow Augmentation in the Myakka River

The sole modification made to the District's basic MFL approach to deal with the issue of agricultural flow augmentation in the Myakka River was to employ a single benchmark period instead of two periods as was done for the Alafia River and Middle Peace River MFLs. As noted above, the panel supports this modification and believes it to be reasonable and consistent with the District's overall approach. However, it should be noted that this modified MFL approach, focusing as it does on *low* flow thresholds and prescriptions for flow *reductions,* does little if anything to prevent flows from being *augmented* above natural background levels, nor does it correct the current flow augmentation problem in the watershed.

Flow augmentation and a change from intermittent to perennial flow conditions can affect wetland and riparian plant communities. For example, wetland hardwoods in the area around Flatford Swamp on the Myakka may be showing increased mortality due to increased duration of flooding from flow augmentation. Bunn and Arthington (2002) point out that the loss of wet-dry cycles can reduce growth and survival of native aquatic macrophytes and set the stage for increased invasion of non-native species. Setting MFLs also may require that historic minimum flows be retained in intact rivers or returned in rivers with significant flow augmentation.

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Errata / Comments by Page Number in 03-21-05 Alafia MFL Draft Report

iii-xiii Table of Contents, List of Figures, and List of Tables need to be modified to show changes made to text as indicated below

xiv 1st paragraph, line 3: add comma after "significant harm"

xiv 2nd paragraph, line 5: add comma after "To accomplish this task"

xiv 2nd paragraph, line 7: change "evaluation flows" to "evaluation of flows"

xiv 2nd paragraph, last line: add period to end of sentence

xiv 3rd paragraph – "standards for the Lithia Springs gage site was" to "standards for the Lithia Springs gage site were"

xv 2nd paragraph, line 7: add comma after "(374 cfs)"

xv Period after last sentence on page.

1-2 "Stalnaker et. al" to "Stalnaker et al."

1-3 Part "1)" in second listing: delete 1st "should" in "A modified flow should regime should...." to read "A modified flow regime should...."

1-3 Last paragraph: "Hill et al" to "Hill et al."

1-4 "(typically develops multiple flows requirements" to "typically develops multiple flow requirements"

1-5 2nd paragraph beginning "The District's...", 4th sentence: delete "waters" from "Impacts on the water waters resources...." to read "Impacts on the water resources...."

1-6 1st paragraph: Shaw et al. 2004 needs to be added to the Literature Cited section.

1-6 Delete leading blank from 2nd paragraph, beginning with "Following assessment...."

1-7 Last paragraph: "days constitutes" to "days constitute"

1-10 1st paragraph, 2nd last line: add "the" to text to read "flow, level or volume or some combination of the three for...."

2-1 Last line: east-central Polk County should be west-central Polk County

2-3 "period or record" to "period of record"

2-3 Move heading "2.1.3 Physiography...." to top of next page (in final copy).

2-4 2nd paragraph, line 7: add comma before "which" (and elsewhere throughout text)

2-4 2nd paragraph, line 10: add comma to text to read "elevations of 42 and 75 feet**,** respectively." (Add commas before "respectively" throughout text)

2-4 2nd paragraph, last 3 lines: how can open water systems be "natural" if most of the areas "are of phosphate mining origin"?

2-5 "Lower Floridan" to "Lower (LFA) Floridan"

2-6 "silicilastic" to "siliciclastic"

2-7 Period after the reference in parenthesis.

2-10 Labels are needed for the two figures to identify which figure is from May and which figure is from September.

2-10 Add period to end of caption for Figure 2-4

2-11 Add period to end of caption for Figure 2-5

2-13 1st paragraph: "Regression analysis performed by Basso.....were generally inconclusive. Coefficient of determination (r^2) values....." Were these the r^2 values for all models or only for the significant models? This should be clarified.

2-13 Start of second paragraph: “bewteen” to “between”

2-13 2nd paragraph, line 6: add comma to text to read “2-8 for Lithia and Buckhorn Springs, respectively.”

2-14 Lines 1 and 2: change sentence from “...analyses showed a weak.....correlation” to “...analyses showed weak.....correlations”

2-14 Clarify the text on this page. On page 1-9 and 1-10, you define flow, discharge, and water level. By spring flows in line 3, do you mean volume (or velocity) of water? Last sentence: I assume that you are referring to “river water level data...”? If so, add the word “river” to the sentence.

2-14 Figure 2-7 would be easier to interpret if all values were given to two decimal places, without leading zeroes.

2-15 Figure 2-8: drop leading zeroes

2-16 “classification systems” repeated twice in row in second paragraph

2-16 3rd paragraph, line 8: “an MFL” to “an MFL analysis”

2-16 3rd paragraph, line 2: change “Alafia-mainstem” to “Alafia Mainbranch” to match Table 2-1

2-18 1st Paragraph, line 8: “subgoupings” to “subgroupings”

2-18 Indicate how “wetlands” and “water” increased over time (Table 2-2 and Figure 2-10). Was it due to mining, new urban retention/detention ponds, new canals...? Or, was it due to the change in the resolution of the data bases on which the tables, figures, and maps were generated? See also Tables 2-3 and 2-4 and Figures 2-12 and 2-14.

2-18 3rd paragraph, line 8: “off set” to “offset”

2-20 Table 2-2: change caption from “...Alafia River watershed for three...” to “...Alafia River watershed (269,986 acres) for three...”

2-20 Delete “%” signs from each number in Table 2-2. Caption indicates that numbers are percentages.

2-20 Table 2-2: delete “Total Acres 269986 269986 269986" from bottom.

2-20 Mention that decline in urban land use in the South Prong Sub-Basin was due to change in the resolution of the data sets.

2-22 Table 2-3: change caption from “...Alafia River watershed for three...” to “...Alafia River watershed (88,303 acres) for three...”

2-22 Delete “%” signs from each number in Table 2-3. Caption indicates that numbers are percentages.

2-22 Table 2-3: delete “Totals 88303 88303 88303" from bottom.

2-22 Last paragraph, line 1: change “... 141 square miles in size.” to “...141 square miles (90,115 acres) in size.”

2-23 Line 3: add comma after “Collectively”

2-23 Lines 4 and 5: add comma after “During this same time period”

2-25 Table 2-4: change caption from “...Alafia River watershed for three...” to “...Alafia River watershed (90,115 acres) for three...”

2-25 Delete “%” signs from each number in Table 2-4. Caption indicates that numbers are percentages.

2-25 Table 2-4: Delete “Total Acres 90115 90115 90115" from bottom.

2-25 Last paragraph, 1st line: change “... 43 square miles and...” to “...43 square miles (27,287 acres) and...”

2-26 1st paragraph, line 2: change "...19 square miles." to "...19 square miles (16,281 acres)."
2-26 2nd paragraph, line 1: change "...22 square miles and..." to "...22 square miles (14,288 acres) and."
2-26 3rd paragraph, lines 1 and 2: change "...for this report." to "...for this report (4,826 acres)."
2-27 1st paragraph, line 1: change "...21 square miles in area,..." to "21 square miles (13,490 acres) in area,..."
2-27 1st paragraph, 1st sentence: delete second period from end of sentence
2-27 1st paragraph, line 4: add "%" after "7"
2-17 1st paragraph, line 7: add "%" after "46"
2-27 2nd paragraph, line 3: change "...30 square miles..." to "...30 square miles (19,309 acres)..."
2-28 1st paragraph, line 3: delete apostrophe from "1930's"
2-28 2nd paragraph, line 5: "Stoker et al." instead of "Stoker et al"
2-28 3rd paragraph, line 1: "Multidecal" should be "Multidecadal"
2-29 Last paragraph, line 12: add comma after "state" to read "...part of the state, where..."
2-31 1st paragraph, last line: delete "was" to read "...where rainfall increased."
2-33 2nd paragraph, line 5: change "...in the 40s,..." to read "...in the 1940s,..."
2-33 Last sentence: "uneeded" to "unneeded"
2-35 2nd paragraph, line 1: change "As a result of work on,..." to "As a result of findings in..."
2-36 End of first paragraph in 2.3.3: "flows record" to "flow records"
2-37 2nd paragraph, line 2: "hydrographs" to "hydrograph"
2-37 Table 2-5: move "(Block 3)" under "End Wet"
2-37 Table 2-6: capitalize "day" and "days"
2-39 Table 2-7: change font to make it easier to read
2-40 Line 2: "forth highest flow" to "fourth highest flow"
2-40 2nd paragraph, last line: add comma to text to read "...57 cfs, respectively."
2-40 3rd paragraph, line 6: "335 square mile" to "335 square miles"
2-40 Last paragraph, line 2: AFigures 2-16 to 2-20" should read "Figures 2-17 to 2-19"
2-41 Line 1: delete apostrophe from 1970's
2-41 Line 6: add period to "al" in "Stoker et al"
2-41 Last sentence discusses calcium and sulfate, but no figures are provided. Figures might be useful. These could be added to appendix.
2-49 2nd paragraph, line 6: "Figure 2-20" should read "Figure 2-21"
2-49 2nd paragraph, line 8: capitalize "thiel"
2-49 2nd paragraph, last line: "Figure 2-21" should read "Figure 2-22"
2-51 Y-axis label should read : "Flow (cfs)"
2-51 "THEIL" should read "THIEL"
2-51 Fix legend on right side of graph: "o . .."
2-52 1st paragraph, line 6 reads 63%, while Table 2-8 indicates 62% increase - which is correct?
2-52 Table 2-8: move "Percent of Watershed Mined" heading to right over the three columns of data and add line below the heading.

2-52 Table 2-8: add "Year" heading over column of years.
2-52 2nd paragraph, line 2: "mining related" should read "mine-related"
2-52 2nd paragraph, lines 5 and 6: "mine related" should be hyphenated
2-58 On line 3, "Buckhorn Springs" is used, while on line 10, "Buckhorn Spring" is used. Be consistent throughout text when referring to this site.
2-60 Heading at top of page: add "s" to end of "Spring"
2-60 1st paragraph, line 3: add comma after "Fortunately"
2-60 1st paragraph, last line: "evenly been days" to "evenly between days"

2-60 2nd paragraph, line 3: add "s" to "Spring"
2-60 2nd paragraph, line 7: "by USGS" to "by the USGS"
2-60 3rd paragraph, line 1: add "s" to "Spring"
2-60 3rd paragraph, line 8: add "(R^2=0.???)" after "...there is a good relationship"
2-60 3rd paragraph, line 13: change "The data suggests..." to "The data suggest..."
2-60 3rd paragraph, last sentence: reword to "The stage at Lithia Springs is under control of the river for much of the year."
2-61 Figure 2-27: change "Discharge" to "Flow" to be consistent with other figures
2-63 Figure 2-29: delete "_" from after the Y and X-axis labels
2-63 Figure 2-29: "THEIL" should read "THIEL"
2-63 Figure 2-29: Fix legend on right side of graph: "o . .."
2-63 Figure 2-29: add "s" to "Spring" in figure caption
2-63 Last paragraph, lines 1 and 7: add "s" to end of "Spring" in 3 places
2-64 Figure 2-30: change "Discharge" to "Flow" to be consistent with other figures
2-64 Figure 2-31: "THEIL" should read "THIEL"
2-64 Figure 2-31: Fix legend on right side of graph: "o . .."
2-66 Last paragraph: four references are made to the North Prong of the Alafia River, but Figures 2-32 and 2-33 (that are referenced) provide no data for the North Prong. Add a figure for the North Prong.
2-66 Last paragraph, last sentence: text says "While concentrations greater than 4 mg/l P have not been recorded since 1990,..." but Figure 2-32 has a value greater than 4 mg/l P (~Feb 2000). Which is correct?
2-67 Line 3: modify text to read "The high historical (pre-1970) P concentrations..."
2-68 Figure 2-32: rescale X-axis of top figure to end in Feb 2000 rather than 2010. This would make it easier to compare the top and bottom graphs.
2-69 Figure 2-33: rescale X-axis of top figure to end in Feb 2000 rather than 2010.
2-69 Figure 2-33: should caption read "... at the South Prong Alafia River near Lithia, FL."?
2-70 2nd paragraph, 1st sentence: When did the phosphate mining start? Add this to report.
2-71 Figure 2-34: rescale X-axis of top figure to end in Feb 2000 rather than 2010.
2-72 Figure 2-35: rescale X-axis of top figure to end in Feb 2000 rather than 2010.
2-73 2nd paragraph: text indicates that the 1990 to 1999 mean concentration of.....is still ten times higher than the 1956 to 1959 mean..... Where are these data? No nitrate/nitrite data are indicated for this time period on Figure 2-36. Does a reference need to be added?
2-74 Figure 2-36: rescale X-axis of top figure to end in Feb 2000 rather than 2010.

2-74 Figure 2-36: The top figure shows a data point at ~1967, but no residual value is shown for ~1967 on the bottom figure. What happened to the residual value?
2-74 Figure 2-36: figure caption should read "Nitrate or nitrate/nitrite nitrogen concentrations...."
2-75 Figure 2-37: rescale X-axis of top figure to end in Feb 2000 rather than 2010.
2-75 Figure 2-37: figure caption should read "Nitrate or nitrate/nitrite nitrogen concentrations...."
2-75 Figure 2-37: units on Y-axis of top two figures should be "(mg/l N)"
2-76 4th line from bottom of page: "Table 2-9" should read "Table 2-11"
2-78 Figure 2-38: rescale X-axis of top figure to end in Feb 2000 rather than 2010.
2-78 Figure 2-38: There is an outlier in the top two figures. Has this value been checked?
2-79 Table 2-9: change legend to read "...analysis of residuals **(**from various water.....flow**)** versus time."
2-79 Table 2-9: right align data to make it easier to make comparisons amongst numbers
2-79 "Nox" to "NOx
2-80 Table 2-10: change legend to read "...analysis of residuals **(**from various water.....flow**)** versus time."
2-80 Table 2-10: right align data to make it easier to make comparisons amongst numbers
2-81 Table 2-11: change legend to read "...analysis of residuals **(**from various water.....flow**)** versus time."
2-81 Table 11: right align data to make it easier to make comparisons amongst numbers
3-1 Last paragraph: "Gore et al. comments" to "Gore et al. (2002) comments"
3-2 Last part of web site needs to be in blue and underlined.
3-2 Last sentence: "middle Peace River" to "Alafia River"
3-3 Point 2 at top: "amount of flow:" to "amount of flow;"
3-3 last line: add comma after "i.e."
3-4 1st paragraph, line 7: The text reads "By plotting the response of wetted perimeter to incremental changes in discharge, an inflection...." Figure 4-11 is plotted in reverse to this. Change figure to match this text.
3-5 Last paragraph: "Cudney and Wallace" to Cufney and Wallace"
3-6 2nd paragraph, last sentence: "of this of habitat" to "of this habitat"
3-7 2nd paragraph, last line: "minimum flows and levels determinations" to "MFL determinations"
4-1 "establishing" to "Establishing" in chapter title
4-2 1st paragraph, line 5: change text from "Buckhorn Spring Main spring" to "Buckhorn Springs Main"
4-2 2nd paragraph, line 1: "hydrologic" to "hydrological"
4-3 1st paragraph, line 4: capitalize "figure" in "(figure 4-2)"
4-5 Line 9: "hydraulic descriptors measured" to "measured hydraulic descriptors"
4-8 Line 2: Period missing on end of sentence.
4-8 Section 4.2.5, line 3: "various habitats the in the" to "various habitats in the"

4-8 Section 4.2.5, 2nd paragraph, line 5: "during sampling event" to "during sampling events"

4-8 Section 4.2.5, 2nd paragraph, line 8: "filamentous algae mats" to "filamentous algal mats"

4-8 Section 4.2.5, 3rd paragraph, line 12: "algae mats" to "algal mats"

4-9 Last line: "throughout at all study sites" to "at all study sites"

4-10 Line 3: "analysis were" to "analysis was"

4-11 6th line from the bottom: "with-in" to "within"

4-12 1st paragraph in section 4.3.2, line 2: "(Gore et al. 2002) suggests" to "Gore et al. (2002) suggest"

4-12 1st paragraph in section 4.3.2, line 8: add comma after "the reviewers"

4-12 Last paragraph, line 3: "back-step calculation" to "back-step calculations"

4-14 Figure 4-7: delete first "e" from "Laregemouth" in top figure heading

4-15 3rd paragraph, line 5: "assume that that" to "assume that"

4-15 4th paragraph, line 1: "dominace" to "dominance"

4-15 Paragraphs 4, 5, and 6: No need to repeat scientific names (paragraphs 5 and 6) once they are given in the report (paragraph 4). Also, pick one format for citing scientific names. You give names without parentheses (paragraphs 4 and 5) and with parentheses (paragraph 6).

4-16 1st paragraph, line 3: delete "(*Lepomis auritus*)"

4-16 2nd paragraph, line 2: use American Fisheries Society accepted common name - delete "sunfish", as the accepted common name for *Lepomis macrochirus* is "blugill" not "bluegill sunfish"

4-16 2nd paragraph, line 2: delete parentheses around *Lepomis macrochirus*. If scientific name was previously given for this species, then also delete the scientific name.

4-16 3rd paragraph, line 4: delete second "and" from "Florida Fish and Wildlife and Conservation Commission"

4-16 Last paragraph, line 1: "Hydrographs" to "Hydrograph"

4-18 1st paragraph, lines 5 and 6: change "...occur seasonally, flows record for..." to "...occur, flow records for..."

4-18 2nd paragraph, line 11: "Block, 3 began" to "Block 3, began"

4-18 3rd paragraph, line 1: delete "very"

4-18 3rd paragraph, line 11: change "late" to "later"

4-19 Table 4-1: move "(Block 3)" to under "End Wet"

4-19 Table 4-1: capitalize "date", "day", and "days" in column headings

4-20 2nd paragraph, line 3: add "as an example" after "...(see Figure 4-11" and move comma to read "...(see Figure 4-11 as an example, and Appendix WP)."

4-21 Figure 4-11 - both plots: "Wetted Perimeter" should be the dependent or response variable (i.e., Y axis) and "Flow" should be the independent variable (i.e.., X axis)

4-22 Last paragraph, line 4: change text to read "...(see Figure 4-12 as an example)."

4-22 Last paragraph, last sentence: Text is confusing. Is the text in the sentence redundant? "...at all HEC-RAS cross sections at all sampled cross-sections was used..."

4-23 Figure 4-12: Add text to first sentence to read "...and flow at RS 60 cross-section..."

4-23 Figure 4-12, 2nd sentence: Shouldn't the sentence read "The upper-left plot..."? The upper left plot shows flows from 0 to 5000 cfs, while the upper-right plot only goes to 90 cfs.

4-23 Figure 4-12: Change text in last sentence from "The next three..." to "The other three..."

4-23 Last sentence: "...populations for low flow periods can be..." should read "...populations for this low flow period can be..."?

4-23 Last line: "Simulation analysys (PHABSIM)" to "Simulation (PHABSIM) analysis"

4-24 1st paragraph, line 5: "bluegill sunfish" should read "bluegill"

4-24 1st paragraph, line 8: "These factor were..." should read "These factors were..."

4-24 3rd paragraph, line 4: "April 20" should be "April 19"

4-24 3rd paragraph, line 5: "bluegill sunfish" should read "bluegill"

4-24 3rd paragraph, line 8 and 9: "...to be limiting factors. These factors..." should read "...to be limiting values. These values..."

4-24 3rd paragraph, last line: add period to end of sentence

4-25 1st paragraph, line 8: add comma after "Ordinarily" to read "Ordinarily, the dry..."

4-25 1st paragraph, line 8: "mutidecadal" to "multidecadal"

4-25 1st paragraph, last line: Is the term "factors" being used correctly in this sentence?

4-25 2nd paragraph, line 1: "Junk et. al." to "Junk et al."

4-25 Last line: add comma after "soils"

4-26 3rd paragraph, line 4: "bluegill sunfish" should read "bluegill"

5-1 1st paragraph, line 5: change "for Lithia gage site" to "for the Lithia gage site"

5-1 Last paragraph: text reads "...where low flow requirements are relatively high were examined..." Should this read "...where low flow requirements are the highest were examined..."

5-2 Figure 5-1, top caption: "Lithis Gage" should be "Lithia Gage"

5-2 Figure 5-1: "47.14 cfs " site 79 requires 54.51 cfs at site" should read "47.14 cfs " site 79 requires 54.51 cfs at site 60"

5-2 Figure 5-2: add "(red line is required flow at the Lithia Gage)" to top caption of figure so that it is consistent with Figure 5-1 (and so Figure 5-2 can >stand alone=).

5-3 Figure 5-2, top caption: "Lowest Wettest Perimeter Inflection Point" to "Lowest Wetted Perimeter Inflection Point"

5-4 Paragraph 1, line 6: "large mouth" should read "largemouth"

5-4 1st paragraph, last 2 lines: capitalize first letters of "prescribed flow reduction" to match text for Block 3 (page 5-10) and Block 2 (page 5-12).

5-4 Figure 5-3, bottom caption: "large mouth" should read "largemouth"

5-4 Last paragraph, last sentence: add comma after "For Block 1"

5-5 Section 5.4, 1st paragraph, line 12: add commas to text to read "...Block 3, when....(374 cfs), a..."

5-5 Section 5.4, 1st paragraph, line 12: "less then" to "less than"

5-5 Section 5.4, 1st paragraph, lines 14/15: add comma to text to read "...(374cfs), more..."

5-6 Middle paragraph: add text to explain how the elevation data were "normalized"

5-6 Last paragraph, line 5: add closing parenthesis after "p<0.05" to read "p<0.05)."
5-6 Last paragraph, last sentence: add comma to read "...Cypress/Palm, Hardwood), Wet..."
5-7 Figure 5-5: add "Elevation (feet)" label to Y axis
5-7 1st paragraph, line 8/9: "...450 to 1478..." should read "...412 to 1478..." based on Table 2, Appendix RH (page 11)
5-7 1st paragraph, line 10: add comma after "1843 cfs"
5-7 Last line: delete second period from end of sentence
5-9 1st sentence: if "Hydric soils were identified at five of the eight floodplain vegetation cross-section sites", why does Figure 5-7 (page 5-10) show hydric data points for all eight cross sections?
5-9 Line 7: add comma at end of line, after "...1576 cfs"
5-9 Second last line: "... 526 to 400 cfs..." should read "... 526 to 4004 cfs..."
5-9 Second last line: "...required at the gage..." should read "...required at the USGS Lithia gage..."
5-10 Figure 5-7, bottom caption, second line: change text to read "indicators) soils at..."
5-10 Figure 5-7: add period to end of bottom caption
5-10 1st paragraph, line 5: "appropriated" to "appropriate"
5-10 1st paragraph, last line: move "(PFR3)" to end of sentence, before period
5-10 2nd paragraph, lines 8/9: add comma after "To develop the plots"
5-10 2nd paragraph, line 9: "use" to "used"
5-10 Last paragraph, line 1: "Figure 5-8 indicate" to "Figure 5-8 indicates"
5-10 Last sentence: not sure where the justification is for the reference to the Arcadia site
5-10 Line 8: text should read "...as a cutoff, we can supply a..."
5-11 Line 11: delete comma after "While"
5-11 Line 12: add comma after "allowed"
5-11 Line 13: add comma after "water"
5-11 Line 14: add comma after "harm"
5-11 Figure 5-8: add "s" to end of Y-axis label
5-11 Figure 5-8: add closing parenthesis to end of X-axis label 5-12 Short-Term Compliance Standard 2: delete "and" from end of line
5-12 Wording for the 4 standards for Block 3 differ from that for Block 1 on page 5-5. Why not make the wording similar? This is particularly important for number 2 where it reads like all the flow can be appropriated if flow is between 59 and 64.
5-12 Section 5.4.2, last paragraph, line 2: "the prescribe flow" to "the prescribed flow"
5-12 Section 5.4.2, last paragraph, line 4: "standard were" to "standard was"
5-12 Last line of section 5.4.2: change text from "...loss of days for given a flow..." to "...loss of days for a given flow..."
5-12 Last paragraph, line 6: "no more then" to "no more than"
5-12 Last paragraph, line 9: add a comma after "For the Alafia River"
5-13 1st paragraph, line 6: "large mouth" should be "largemouth"
5-13 Figure 5-9 top caption: "Laregemouth" to "Largemouth"
5-13 Figure 5-9 bottom caption: "large mouth" should be "largemouth"

5-13 Last paragraph, line 1: "mud and bedrock" to "mud and bedrock,"
5-13 Last paragraph, line 4: not sure what the authors mean by "linear habitat"
5-14 Figure 5-11: delete second use of "elevations" from the figure caption
5-15 1st paragraph, line 6: text indicates "...5 to 85 cfs..." while table 5-2 has a low of 0.8 for the Lithia Gage at cross-section 60. Why does the text minimum differ from the table minimum? What does "NA*" indicate in Table 5-2?
5-15 1st paragraph, line 7: "Local flows requirements" to "Local flow requirements"
5-15 1st paragraph, lines 8/9: change text to read "...flows at the USGS Lithia gage ranged..."
5-15 Figures 5-2 and 5-3: there are no data in either table that correspond to the last sentence in each caption. Delete sentence or add column of data to each table.
5-16 2nd line: add "(LFT)" to text after "low flow threshold"
5-16 2nd paragraph, line 16: add comma after "255 cfs"
5-16 2nd paragraph, line 17: add comma after "374 cfs"
5-16 2nd paragraph, line 17: change "...Block 3 rather then higher..." to read "...Block 3 rather than the higher..."
5-17 Top portion: all (2) references to "Peace River" should be changed to "Alafia River"
5-17 Top portion: all (4) references to "Arcadia" should be changed to "Lithia"
5-17 Top portion, part 1: change "Fla" to "FL"
5-17 Top portion, part 2: reads as if all the flow in the range from 59 to 69 cfs can be captured
5-17 Top portion, part 3: change "An 15% reduction..." to "A 15% reduction..."
5-17 Top portion, 2nd last line: "prescribe flow" to "prescribed flow"
5-17 Top portion, last line: "Block 2 dose" to "Block 2 does"
5-17 2nd last paragraph, line 5: "...bluegill sunfish..." should be "...bluegill..."
5-18 Figure 5-12, bottom caption: "large mouth" should be "largemouth"
5-19 Table 5-4: "...bluegill sunfish..." should be "...bluegill..." (12 places)
5-21 Section 5.7, line 1: change "associated variation" to "associated with variation"
5-22 Figure 5-13, bottom caption: "large mouth" should be "largemouth" and "Bukhorn" should be "Buckhorn"
5-24 Figure 5-14, bottom caption: "large mouth" should be "largemouth"
5-25 1st paragraph, line 3: should this read "not corrected for withdrawals"?
5-25 1st paragraph, line 4: add comma after "withdrawals"
5-25 1st paragraph, line 10: add comma after "analysis"
5-25 Last paragraph, line 5: Should Table 5-6 be Table 5-7?
5-26 1st line: change "with the step occurring" to "with the step from 13% to 8% occurring"
5-26 2nd last paragraph, line 3: Should Table 5-6 be Table 5-7?
5-27 Table 5-7 caption: "standards for the USGS Alafia River at Lithia, FL gage site." to "standards, for the Alafia River at the Lithia, FL, USGS gage site."

Literature Cited section: Many of the citations have minor edits/clarifications that could be made. Many of these are simply for consistency of format. These do not affect the findings of the report, but would be useful for readers seeking to find the cited materials.

Errata / Comments by Page Number in 08-10-05 Myakka MFL Draft Report

x 1st paragraph, line 1: "significant harm" to "significant harm,"
x 3rd paragraph, last line: "Myakka River" to "Myakka River,"
x 4th paragraph, line 5: "1969 benchmark period" to "1969 benchmark period,"
xi 1st paragraph, line 1: "factor" to "factors"
1-1 2nd paragraph, line 2: Add period after "S" in parentheses
1-2 2nd paragraph, line 15: Delete apostrophe from "1960's" and "1970's"
1-3 Part 1), middle of page: "A modified flow should regime..." should read "A modified flow regime..."
2-1 Section 2.2.1, line 2: Delete "and" after "Hardee"
2-1 Section 2.2.1, line 2: "Counties" to "counties"
2-1 Section 2.2.1, line 8: Delete hyphen from "(34-miles)"
2-3 Figure Header: "Montly" to "Monthly"
2-4 Section 2.2.4 2nd paragraph, line 1: "With the basin" to "Within the basin"
2-5 2.3 title: Change "Peace" to "Myakka"
2-6 2nd paragraph, line 1: "or analysis" to "our analysis"
2-10 Table 2-1, title: Hyphenate "382,764 acre" to read "382,764-acre"
2-10 Table 2-1: Delete "Totals 382764 382764 382764 100.0%" from bottom
2-10 Table 2-1: Delete "%" after all numbers in right column
2-10 Table 2-2: Add zeroes in 3 cells that are blank (Unnamed Creek in 1990, Unnamed Creek in 1999, and Wingate Creek in 1999)
2-11 Line 4: Capitalize "figure"
2-12 Table 2-3, title: Hyphenate "54,322 acre" to read "54,322-acre"
2-12 Table 2-3: Delete "%" after all numbers in table
2-12 Table 2-3: Delete "Totals 54322 54322 54322" from bottom
2-15 Line 3: Add comma after "1990"
2-15 Table 2-4, title: Hyphenate "22,179 acre" to read "22,179-acre"
2-15 Table 2-4: Delete "%" after all numbers in table
2-15 Table 2-4: Delete "Totals 22179 22179 22179" from bottom
2-18 Line 2: Change "...approximately 45% as was..." to "...approximately 53% while..."
2-18 Line 3: Change "...uplands) by 1999 this percentage had..." to "...uplands). By 1999, agriculture had..."
2-18: Line 4: Change "55%" to "65%"
2-18 Table 2-5, title: Hyphenate "9,697 acre" to read "9,697-acre"
2-18 Table 2-5: Delete "%" after all numbers in table
2-18 Table 2-5: Delete "Totals 9697 9697 9697" from bottom
2-21 Line 1: "sub-basin, is" to "sub-basin is"
2-21 Table 2-6, title: Hyphenate "18,634 acre" to read "18,634-acre"
2-21 Table 2-6: Delete "%" after all numbers in table
2-21 Table 2-6: Delete "Totals 18634 18634 18634" from bottom
2-24 Line 5: Add comma after "During this time"
2-24 Table 2-7, title: Hyphenate "36,945 acre" to read "36,945-acre"
2-24 Table 2-7: Delete "%" after all numbers in table

2-24 Table 2-7: Delete “Totals 36945 36945 36945” from bottom
2-27 Line 1: Delete comma after “is”
2-27 Table 2-8, title: Hyphenate “10,843 acre” to read “10,843-acre”
2-27 Table 2-8: Delete “%” after all numbers in table
2-27 Table 2-8: Delete “Totals 10843 10843 10843” from bottom
2-30 Line 1: Delete comma after “River)”
2-30 Line 2: Remove comma after “Hammett (1990)”
2-30 Line 8: Hyphenate “dry season”
2-31 Line 6: Add comma after “state” at end of line
2-31 Line 7: Add comma after “Ocean”
2-33 2nd paragraph, line 2: “with Enfield et al.’s (2001) conclusions” to “with the conclusions of Enfield et al. (2001)”
2-35 Figure 2-25: It would be helpful in making comparisons if both figures were scaled the same.
2-35 Figure 2-25, top: Add horizontal line at 1.5 cfs
2-36 Figure 2-26: Move this 2-page figure to after page 2-38, where it is first referenced.
2-38 Line 1: Add comma after “flow” and “River”
2-38 Line 3: Change “Peace River has...” to “Peace River, have...”
2-38 Line 11: Add comma after “Simply stated”
2-38 2nd paragraph, line 3: Change “...at Arcadia the fact that...” to “...at Arcadia. The fact that...”
2-38 3rd paragraph, lines 9 and 10: Change “Figure 2-26, middle panel” to “Figure 2-26, fourth panel”
2-38 3rd paragraph, line 10: Change “Comparison of flows trends...” to “Comparison of flow trends...”
2-38 3rd paragraph, line 14: Change “was compared...” to “is compared...”
2-38 3rd paragraph, line 15: Change “high flows months” to “high flow months”
2-40 Move “Block” headings in Table 2-9 to above numbers in table.
2-40 In NOTE, change “was done a” to “was done on a”
2-40 3rd line from bottom: Change “this data” to “these data”
2-41 Figure 2-29, both panels: Change Y-axis labels to “Mean Annual Flow (cfs)”
2-41 Figure 2-29, both panels: “THEIL” should read “THIEL”
2-41 Figure 2-29, both panels: Fix legend on right side of graph: “o . ..”
2-41 1st line of text: Add comma after “Interestingly”
2-42 4th line: change “...is believed related...” to “... is believed to be related...”
2-42 Section 2.4.3.3, 1st line: “Multidecal” to “Multidecadal”
2-42 Section 2.4.3.3, 1st paragraph, 13: Should “regression” read “analysis”?
2-42 “multidecadal times periods” to “multidecadal time periods”
2-43 Figure 2-30, all 3 panels: Change Y-axis labels to “Mean Annual Flow (cfs)”
2-43 Figure 2-30, top 2 panels: Change X-axis labels to “Year”
2-43 Figure 2-30, all 3 panels: “THEIL” should read “THIEL”
2-43 Figure 2-30, all 3 panels: Fix legend on right side of graph: “o . ..”
2-45 Table 2-11: Change median values for “Alafia River at Lithia” to integers

2-46 Paragraph 3, line 2: Change "Under most circumstances we anticipate that on most river, these criteria …" to "We anticipate that on most rivers under most circumstances that these criteria"
2-47 5th line from bottom: Delete "very"
2-48 Table 2-12, last column heading: move "(Block 3)" to under "End Wet"
2-48 Table 2-13, last column heading: capitalize "d" in "days"
2-51 Section 2.5.2.1, 2nd paragraph, line 4: "1970's" to "1970s"
2-51 Section 2.5.2.1, 2nd paragraph, line 5: "row crop" to "row crop agriculture"
2-51 Section 2.5.2.2, 2nd paragraph, line 3: "nitrate/nitrate" should read "nitrate/nitrite"
2-52 Why are Tables 2-11 and 2-12 being referenced? Should something else be referenced?
2-54 Figure 2-33, caption: "...residuals of phosphorus..." should read "...residuals of nitrate or nitrate/nitrite..."
2-55 Figure 2-34, caption: "...residuals of phosphorus..." should read "...residuals of potassium..."
2-58 Legend: Blue is a "significant increasing trend" rather than decreasing.
2-58 In Table 2-14. "Nox" to "NOx"
3-2 The Jowett (1993) reference is missing from the literature cited section.
3-2 1st paragraph, last line: Underline "matagorda.phtml"
3-2 2nd paragraph, 2nd last line: Add comma after "swimming"
3-3 Semicolon rather than colon after item 2.
3-6 2nd paragraph, 2nd last line: "...of this of habitat..." should read "... of this habitat..."
3-6 Last line: "Wharton et. al. 1982" to "Wharton et al. 1982"
3-8 Figure 3-1 needs to be cited somewhere in the text.
4-3 Section 4.2.3, line 7: (9 x 3 = 27) ==> "36 instream" should read "27 instream"
4-4 All 6 bulleted items: Add commas after "e.g."
4-4 Parentheses around "e.g., *Panicum* marsh"
4-4 Last paragraph, line 3: "A minimum of three plots were..." should read "A minimum of three plots was..."
4-4 Last paragraph: Delete ".)" from end of line 5 and beginning of line 6.
4-5 Change "non hydric" to "non-hydric"
4-7 2nd paragraph, line 1: "Myakaa" to "Myakka"
4-7 2nd paragraph, line 10: Add period after "etc"
4-7 Last line: Add period to end of sentence.
4-8 2nd paragraph, line 11: Should "...and at was..." read "...and at what..."?
4-8 2nd paragraph, 5th line from the end: "surveyed in with..." should read "surveyed with..."
4-8 2nd paragraph, 5th line from the end: Add comma after "accuracy"
4-9 1st paragraph, line 2: "Gore et al. endorsed" to "Gore et al. (2002) endorsed"
4-9 3rd paragraph, line 2: "back-step calculation" to "back-step calculations"
4-9 3rd line from bottom: Add comma after "established"
4-10 Line 5: "this data" should read "these data"
4-10 Line 5: "deviation for" to "deviation from"
4-11 Figure legend: Period after "4.5" and "Adults" lower case.

4-12 3rd line from bottom: “Wildlife and Conservation” should read “Wildlife Conservation”
4-13 1st line: Add comma after “River”
4-13 2nd paragraph, line 1: “Hydroraphs” should read “Hydrographs”
4-13 Figure 4-6, top heading: “...flow of 400 was...” should read “...flow above 400 cfs was...”
4-14 Figure 4-7, top heading: “...flow of 400 was...” should read “...flow above 400 cfs was...”
4-14 Figure 4-7, caption: “(that 400...” should read “that 400...”
4-14 Table 4-1 caption: “Middle Peace” should read “Myakka”
4-14 Table 4-1 column headings: Capitalize “d” in “date” and “days”
4-15 2nd paragraph, line 3: Change “Figure 4-8 and, Appendix WP” to read “Figure 4-8 as an example and Appendix WP for all plots”
4-16 Figure 4-8: “Wetted Perimeter” should be the dependent or response variable (i.e., Y axis) and “Flow” should be the independent variable (i.e., X axis).
4-16 Line 4: Hyphenate “0.6 ft”
4-16 Line 5: Hyphenate “fish passage”
4-16 Line 8: “Rivers” should read “rivers”
4-16 Line 10: Hyphenate “0.6 ft”
4-16 2nd paragraph, line 3: Hyphenate “0.6 ft” and “fish passage”
4-17 2nd paragraph, last line: Hyphenate “fish passage”
4-18 1st paragraph, line 4: Put parentheses around “i.e., from April 20 to June 24”
4-18 Section 4.7, line 1: Shouldn’t “Figure 4-9" be “Figure 1-1"?
4-20 Line 2: “and soils was” to “and soils, was”
4-20 Line 4: “aknowledge” to “acknowledge”
4-20 Last line: Add period to end of sentence.
5-2 Line 3: “to a local flows” to “to local flows”
5-3 Line 3: “that median year” to “that the median year”
5-3 2nd to the last line: Add comma after “Chapter 2"
5-4 Lines 4 and 5: “A low flow threshold of 0 cfs is recommended established...” should read “Therefore, a low flow threshold of 0 cfs is recommended to be established...”
5-4 Section 5.3, lines 10-12: Text refers to adult and juvenile largemouth bass. Reference is made to Figures 5-3 and 5-4. Figure 5-3 presents median daily flows. Figure 5-4 presents data for only juvenile largemouth bass. Is a figure missing for adult largemouth bass? To what does “all species” in Figure 5-5 refer?
5-5 Figure 5-5 legend: “less the 50%” to “less than 50%”
5-6 Top 2 lines: These need to be moved to the bottom of Figure 5-5.
5-6 11th line from bottom: “less then the” to “less than the”
5-6 10th line from bottom: “1969 a” to “1969, a”
5-6 7th line from bottom: “...of 15% of more...” should read “...of 15% or more...”
5-6 3rd line from bottom: “below 577 cfs” to “below 577 cfs,”
5-11 Figure 5-8: Add period to end of caption.
5-12 Line 4: “927 cfs” should be “827 cfs”
5-13 Legend: “days flow” to “days of flow”
5-13 “inundation” to “inundate” in third box down

5-14 2nd paragraph, line 8: Delete space in “1 %”
5-14 2nd paragraph, line 10: Add comma after “To develop the plot”
5-14 2nd paragraph, 2nd last line: Capitalize “c” in “chapter”
5-15 Second line: “was used” to “was used,”
5-17 Figure 5-12: To what does “all species” refer in caption? Text on page 5-16, 3rd line from bottom, discusses spotted sunfish, but then refers to this figure.
5-21 Section 5.8, 2nd last line: “...Block 2 do not...” should read “...Block 2 does not...”
5-22 Line 7: Add comma after “As discussed in Chapter 2"
5-22 Line 11: Add comma after “...increased flow”
5-22 Lines 14-16: How was the staff able to estimate increased flows due to augmentation? No methods are given.
5-22 9th line from bottom: “period free form” to “period free from”
5-22 4th line from bottom: Delete comma from “Because, the...”
5-22 3rd line from bottom: Add comma after “...Block 3"
5-23 Line 2: Hyphenate “long term”
5-23 Line 6: “median flows were” to “median flows, were”
5-23 2nd paragraph, line 7: Add comma after “In all cases”
5-23 4th paragraph, line 3: “...Myakka River then...” should read “...Myakka River than...”
5-23 4th paragraph, line 4: “other rivers which...” should read “other rivers for which...”
5-23 4th paragraph, line 4: “MFLs on” should read “MFLs”
5-23 4th paragraph, line 8: Add comma after “three decades”
5-24 Line 10: “then” should be “than”
5-24 Line 12: Add comma after “wet cycle”
6-1 Anderson...: Add comma after “Roach”
6-1 Benke, Van Arsdall, ...: capitalize “j” in “jr.”
6-1 Brinson ...: Add comma after “Plantico”
6-2 Bunn...: Add space before “2002." and a period after “S” in Bunn’s initials.
6-2 Cottam…: Add space after “G.”
6-2 Cowardin...: Add comma after “Golet”
6-2 Cudney...: “11980.” should read “1980.”
6-2 Cudney should be Cufney
6-2 Dunbar...: Add comma after “Acreman” and add space before “83pp.”
6-3 Gore and Judy: Delete comma after “Gore, J.A.”
6-3 Gregory...: Add comma after “McKee”
6-3 Hammett...: Add comma after “Turner, Jr.”6-4 Kelly...2005a: Add period after “Leeper”
6-5 McCabe...: Delete comma after “McCabe, G.”
6-5 McKevlin...: “p. 173 - 204" should read “Pp. 173-204"
6-5 McKevlin...: “in” should not be italicized and “Management” should be “Management”
6-5 Murphy…: “resource” to “Resource”
6-5 PBS&J, Inc. 1999…: Space after “Brooksville”
6-5 Postel…: Add a period after “S” and change “fife” to “life”
6-5 Reiser...: Add comma after “Wesche”
6-6 Scheele…: Pages can’t be “37-31”

6-6 Smith...: Delete comma after “Smith, D.L.”
6-6 Smock...: Delete blank line after this reference
6-6 Stalnaker 1990: Delete comma after “31-33 in”
6-7 Thorp...: Add comma after “Flynn”
6-7 Vannote...: Add “J.R. Sedell, and C.E. Cushing” after “Cummins”