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## MFL PEER REVIEW REPORT

**Subject:** Technical peer review, minimum flows and levels (MFL) evaluation, Johns Lake, Lake and Orange Counties, Florida  
(Contract #SK376F0, Work Order #3)

**For:** St. Johns River Water Management District (SJRWMD or “District”)

**Reviewer:** Douglas T. Shaw, Ph.D., The Nature Conservancy

**Date:** April 3, 2009

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### Introduction and Scope of Review

This letter report comprises my peer review of the District’s minimum level evaluation for Johns Lake in Lake and Orange Cos., Florida, one of six lake MFL evaluations reviewed as part of this contract. The evaluation and proposed minimum levels are documented in the draft SJRWMD technical report ***Minimum Levels Evaluation: Johns Lake, Lake and Orange Counties, Florida*** by C.P. Neubauer, Ph.D., St. Johns River Water Management District, Palatka, Florida, 2008 (“Johns Lake MFL Report” or “MFL Report”). My report is based on review of the draft technical report, documentation provided during our field visits to the six lakes August 27-29, 2008, as well as the following supplemental documents:

1. *Minimum Flows and Levels Method of the St. Johns River Water Management District, Florida, USA* by C.P. Neubauer, G.B. Hall, E.F. Lowe, C.P. Robison, R.B. Hupalo and L.W. Keenan, *Environmental Management* 42(6):1101-1114, 2008 (“MFL Methods Paper”).
2. *A Quantitative Method for Determining Surface Water Inundation/ Dewatering Signatures for Riparian Plant Communities*, Draft manuscript by C.P. Neubauer, C.P. Robison, T.C. Richardson, P. Valentine-Darby and G.B. Hall, *Ecological Engineering*, 2008.
3. *Hydrology of Central Florida Lakes – A Primer* by D.M. Schiffer, U.S. Geological Survey, Circular 1137, 1998.
4. *Johns Lake Minimum Flows and Levels Hydrologic Methods Report 12/19/08 Draft* by C.P. Robison, St. Johns River Water Management District, Palatka, Florida 2008 (“Johns Lake Hydrology Report”)

Detailed comments below are confined to the Johns Lake MFL Report.

The scope of the review includes the following:

- Assessment of the adequacy of the environmental data used in the MFL evaluation in terms of quality and length of record
- Assessment of the methods and procedures for data analysis, including statistical analyses where appropriate
- Evaluation of the validity and appropriateness of all assumptions used in the development of MFLs
- Determination if the data, analyses, and interpretation of results support the recommended MFLs.

**Review Comments** (Page citations refer to Johns Lake MFL Report unless otherwise noted)

1. Page ix, List of Figures – Paging is incorrect for Figs 7-14.
2. Page 1, Introduction – It would be helpful to include here any particular reasons why Johns Lake was placed on the priority list for MFL development.
3. Pages 1-2, Factors to be Considered When Determining MFLs and Pages 19-20, Consideration of Environmental Values Identified in Rule 62-40.473, *F.A.C.*– it would be helpful to indicate here which factors were considered in the development of the Johns Lake MFLs. Also, for riverine MFLs, the District typically contracts or conducts a water resource values (WRV) assessment in addition to preparing an MFL determination study. Because it is not mentioned in the Johns Lake MFL Report, I am assuming a separate WRV assessment will not be conducted for this MFL. However, it would be helpful if this were clarified in the MFL Report.
4. Page 4, Johns Lake Wetlands – Please include one or two characteristic species (e.g., wax myrtle?) in the description of the Transitional Shrub community to better distinguish it from the Shrub Swamp community.
5. Page 19, Surface Water Inundation/Dewatering Signatures (SWIDS) – In the second paragraph, the first sentence includes the phrase “...up to three vegetation community elevations...” it is not clear what three vegetation communities this sentence refers to.
6. Pages 27-28, Structural Alterations and Other Changes – The information on the three control elevations is unclear. If there is no discharge from the lake when level is less than 96.9 and positive discharge from the lake when greater than 98.9, what happens when lake levels are between these two elevations? Also note that the Johns Lake watershed impervious cover of 17% approaches or exceeds published thresholds for urbanized watersheds and associated degradation of water quality, biotic integrity and hydrologic regime, leading one to suspect that the lake’s

plant communities reflect disturbed conditions. In the last sentence in this section, it is stated that the soils and vegetation did not appear to be in transition due to anthropogenic changes. Can any evidence of this conclusion be cited here?

7. Page 29, Minimum Levels Determination – The discussion of sandhill lake hydrology and the decision to focus MFL determination on FH and FL and not recommend a minimum average is reasonable and appropriate. However, the way this part of the narrative is written suggests that water levels “fluctuate dramatically,” lack stable vegetative communities and are strongly influenced by multi-decadal cycles. This, for some readers, may call into question the confidence in vegetation-based determinations of Frequent High and Frequent Low Levels. It would be helpful here to include more discussion, or perhaps a diagram, here that better explains the relationships between multi-decadal highs and lows and the vegetation signatures used in determining FH and FL levels.
8. Page 29, Minimum Frequent High (FH) Level and Page 30, Minimum Frequent Low (FL) Level – Better explanation is needed to document how the “event duration” for each of these levels, 30 days for FH and 120 days for FL, is chosen. Is this professional judgment or standard practice for defining hydrologic events or is there a more substantive basis? I think this may be addressed to some extent in the MFL methods paper, but here in the MFL Report it comes across as arbitrary.
9. Page 29, Minimum Frequent High (FH) Level with reference to Figure 11 – Several related concerns here: Given the large variation in the SWIDS for the same communities from different locations, should we always be using the driest of these signatures (e.g., Lake Hires in this case) to define MFLs when that signature could be, statistically, an outlier? Or would it be better to use a SWID that is closer to the median of all the reference curves? This outlier question becomes especially significant for communities like “shrub swamp” that are not always “natural” communities, but instead are often a successional stage indicative of an altered fire or hydrologic regime in another wetland community, like emergent marsh. So choosing the driest shrub swamp could in fact be starting from a baseline that is already disturbed (possibly over-drained), perhaps even “significantly harmed.” These concerns could be addressed in several ways: (1) more careful statistical treatment of the SWIDS reference curves to minimize the possibility that any of the curves used to set the FH (or other minimum levels) are statistical outliers, (2) more detailed explanation of how the SWIDS reference sites (e.g., Fig. 11) were selected to ensure that no outliers or already-harmed sites are included. In any case, the Lake Hires site used here is so much drier than the others in Fig. 11 that it should not be used unless the District can explain why it needs so much less inundation than the others.

10. Page 36, Figure 9 – not clear why there are two communities each at approximately the same elevation, one called “shallow marsh” and the other called “emergent marsh.” Please reconcile or more clearly distinguish between these two communities.
11. Page 40, Figure 13 – in the upper part of the figure, the curve for Halfmoon Lake should be better highlighted to further distinguish it from the other SWIDS curves, since it is a critical site for the Johns Lake analysis. Also, in the legend, it would be helpful to indicate which of these reference sites are sandhill lakes and which are not; or if all are sandhill lakes, please indicate.

### **Findings and Recommendations**

1. **Recommendation:** Improve Johns Lake MFL Report by addressing the editorial comments 1-11 above.
2. **Finding:** Based on my review of the Johns Lake MFL and Hydrology Reports and field inspection of transects, I feel that the environmental data data from the site and the data collection procedures used to support this MFL determination are appropriate, repeatable and scientifically sound. Although there is little data available that reflect the unaltered conditions of the lake and its watershed, the District has done a commendable job through research and modeling to gain an understanding of how sandhill lakes such as Johns Lake function over the long term. That knowledge is appropriately incorporated into this MFL determination.
3. **Finding:** Similarly, the methods and procedures for data analysis, including selection, parameterization and calibration of the hydrologic model for Johns Lake are valid and appropriate, and the assumptions used in data analysis and MFL determination are reasonable and justified by the District’s previous experience and literature citations.
4. **Finding and Recommendation:** The SWIDS-based methodology for determining minimum levels at Johns Lake is conceptually sound and provides a useful basis for quantifying the hydrologic regimes of different wetland plant communities in a way that enables the use of traditional event frequency analysis. However, more attention should be focused on the selection of particular SWIDS curves from reference sites to ensure that no statistical outliers or already-harmed sites are used to set MFLs. In the case of Johns Lake, I believe that the data may not support the use of the Lake Hires site (i.e., the driest of the sites) for setting the Frequent High level. As noted above in Comment 10, the Lake Hires site is so

much drier than the others in Fig. 11 that it should not be used unless the District can better explain (1) why it is an appropriate comparison with the shrub swamp community at Johns Lake, especially given that this community type is often indicative of an altered hydrologic regime, and (2) why it needs so much less inundation than the others. I recommend that this issue be addressed as noted in Comment 10, through more careful statistical treatment of the SWIDS reference data, more detailed explanation of how the reference sites were selected to avoid outliers, and the possible selection of a different (wetter) reference site for setting the Frequent High. The determination of Frequent Low level will also benefit from better explanation of the variability shown in the SWIDS curves for shallow marsh and from more details regarding reference site selection.