draft technical memorandum

To:	Dr. Andrew Sutherland, PhD, SJRWMD
From:	Dr. Phil Burkhalter, P.E., PhD, Trihydro Corporation Mr. Travis Richardson, CPSS, MS, T. Richardson Soils and Environmental
Date:	May 28, 2025
Re:	Independent Technical Peer Review Minimum Levels Reevaluation for Lake Prevatt, Orange County, Florida

Trihydro Corporation (Trihydro) and T. Richardson Soils and Environmental (TR Soils) are pleased to provide this scientific peer review of the Minimum Levels Reevaluation for Lake Prevatt, Orange County, Florida Minimum Flows and Levels (MFLs) Report. Phil Burkhalter, PE, PhD (Trihydro) and Travis Richardson, CPSS, MS (TR Soils) reviewed all documents provided for reference and Peer Reviewed the documents as requested in the Scope of Work. A Kickoff Meeting and Site Review took place on February 24, 2025. All documents were reviewed and initial findings were presented at a Public Meeting on April 10, 2025. The SJRWMD provided a response to the Initial Findings on May 15, 2025. The SJRWMD responses were evaluated, and the final comments have been adjusted with consideration of the additional analysis provided. The final comments are presented and are grouped by specific topic with figures included in Attachment A. Typographical and editorial comments as well as items addressed by the SJRWMD responses have been removed from the final Comments Table (Attachment A). Initial comments are provided in Attachment B and the SJRWMD responses to initial comments are provided in Attachment C.

The amount of water available (freeboard) or shortfall (deficit) are evaluated in the MFLs process using a combination of surface water and groundwater modeling (HSPF and MODFLOW-2005). The East-Central Florida Transient Expanded (ECFTX v. 2.0) groundwater model, which was developed using a regional MODFLOW-2005 model of the Floridan Aquifer, was recalibrated to the Wekiva Springs contributing basin and Seminole County and has been peer reviewed by others. The HSPF and MODFLOW-2005 models are industry standards and represent the best tools available to evaluate MFLs for the SJRWMD MFLs method.

The following documents were peer reviewed:

- Shadik, C.R., E. Revuelta, A. Sutherland, A. Karama and H. N. Capps Herron. 2025. Minimum Levels Reevaluation for Lake Prevatt, Orange County, Florida. Draft Report. Bureau of Water Supply Planning, SJRWMD.
  - Appendix B: Hydrological Analyses;
  - Appendix C: Environmental Methods, Data and Metrics;
  - Appendix D: MFLs Status Assessment;

- Appendix E: WRVs Assessment; and
- Appendix F: DEM Development.

The original 1997 MFLs memo for Lake Prevatt and the Hydroperiod Tool Design; ESRI 2018 were reviewed as background material and were not peer reviewed.

The objectives of the peer review are to answer the following questions:

1. Validity and appropriateness of environmental analyses and criteria:
   - Are the environmental data used to develop environmental criteria adequate and appropriate?
   - Are the methods and procedures used to develop and assess environmental criteria appropriate?
   - Have all relevant environmental values been evaluated?
   - Are assumptions reasonable and consistent given best available information?
2. Validity and appropriateness of hydrological analyses:
   - Are the hydrological data used to develop and assess environmental criteria adequate and appropriate?
   - Are the hydrological analyses used to develop and assess environmental criteria appropriate?
   - Are assumptions reasonable and consistent given best available information?
3. Appropriateness of recommended MFLs:
   - Are data used to support conclusions and recommendations adequate and appropriate?
   - Are the assumptions used and conclusions made in the development of protective minimum levels reasonable and appropriate given best available information?

KEY DISCUSSION TOPICS

Appendix B – Hydrological Analyses

Hydrological analysis – The overall approach for the Hydrological Analysis Process described in the MFL Report Appendix B is generally valid and appropriate. The calibrated ECFTX v. 2.0 groundwater model is used to calculate a hydraulic head in the upper Floridan Aquifer (UFA) beneath the lake for a prescribed pumping condition. The calculated UFA head is then used as a boundary condition in the calibrated Lake Prevatt HSPF model to simulate the exchange of flow between the lake and UFA. Historical regional and local groundwater withdrawals are considered in the analysis.

The ECFTX v. 2.0 model only provides drawdown back to 2004. A simple regression model was therefore developed for the total pumping rate *vs.* drawdown from hypothetical model simulations using the ECFTX v. 2.0. The best fit regression model was used to estimate the drawdown time series at Lake

Prevatt for the pre-2004 period. The ECFTX v. 2.0 was used to estimate the drawdown for the post-2004 period. Review comments for Appendix B include the following:

1. Consider tightening up terminology to make sure the reader can follow the analysis steps. For example, be sure to always specify between “simulated” vs “observed” or between “lake” vs “groundwater” levels. There were places in the text where it was not clear.
2. In reference to model performance, what are meant by “reasonably” and “adequately”? What were the calibration criteria, i.e., what constitutes a “good” calibration?
3. How many/which cells were used to extract the model output data? What is the cell size? How does the cell size compare to the lake area?
4. Although these simple single linear equations provide a high correlation, using a weighted function (i.e., multi-part linear or polynomial) that separates out the pumping locations by distance seems like it would be more physically realistic. The wells closer to the lake would have more of an impact vs wells that are farther away. However, it appears that using the linear approximation to represent the non-linear drawdown impacts is adequate in this case.
5. The regression analysis R2 values are so high that it seems like it does not matter which buffer you use.
6. Would be helpful to have a figure that includes pumping well locations.
7. How does the 15-mile radius compare to the zone or radius of influence that would be calculated by the Theis equation for an average or maximum pumping rate for this region?
8. Related to filling the missing water use data, how well does the exponential growth assumption fit the periods where you do have historical data? Would be good to show or provide a comment here to confirm that this is a valid assumption.
9. Regarding the linear interpolation assumption to translate monthly data into daily, did you consider other interpolation methods (e.g., cubic spline) that might better capture seasonal behavior? Probably would not make much of a difference, but could be more realistic.
10. In reference to the “observed and estimated” groundwater levels near Lake Prevatt, how much of this data is observed, and how was it estimated.
11. Text on page 14 of Appendix B is the first mention of return flows. Need to add a definition and describe how they are calculated.
12. Related to future climatic conditions, it would be helpful to add some information on the current state of climate modeling for the southeast US and possible future changes to the hydrology (more or less rain, higher temps, higher ET, etc.). Then describe how these possible changes might affect results. I agree that our understanding is limited, but I think some broad statements would be appropriate.

The SJRWMD provided additional rainfall analysis using the Standard Precipitation Index as well as other data and analysis to demonstrate that there is a substantial rainfall deficit post 1980. While rainfall deficits likely account for much of the lake level fluctuation, other factors including land use changes in the basin as well as consumptive are likely contributing factors. The additional analysis illustrates that the lake level is relatively high during some periods of rainfall deficit (i.e. negative SPI) and low during some periods of higher rainfall (i.e., positive SPI). However, the six-month moving average of daily rainfall appears to have a direct relationship to the lake levels. The additional analysis addresses the peer reviewer and public comments regarding the difference in lake level fluctuations pre/post 1980.

Appendix C – Environmental Methods, Data and Metrics

Field Methods and Transect Data

Transects were selected based on where multiple commonly occurring wetland communities would be traversed including unique wetland communities. Establishment in areas to capture shallow reaches and at locations of previous MFL data collection sites if possible. Vegetation sampling procedures at the selected transects used the line-intercept method and the belt transect method. Soil sampling procedures at the selected transects documented the presence and depth of histic epipedons and histosols along with the extent of other hydric soil indicators.

1. The vegetation naming system follows the SJRWMD's Vegetation Classification System (Kinser 2012). Consider consistently using this naming convention for the mapped vegetation communities (topobathy/hydroperiod tool) or standardize names to another system to allow direct comparisons among data. Identify upland communities with a footnote if there are deviations from a noted classification system.

   The SJRWMD Vegetation Classification System is a relatively simplified system and has substantially less detail on plant species, hydrology, and fire compared to FNAI Natural Communities. Consider shifting to FNAI or updating the SJRWMD Classification System with more detail and making it a Special or Technical Publication that is publicly available.

2. Community breaks were established with and understanding of ecology, substantial onsite data collection and application of reasonable scientific judgement. Reasonable scientific judgment is highly variable depending on the experience of the individual. To minimize the potential error with this method it may be valuable to have each staff member present in the field (minimum 3) establish community boundaries and names independently and then reconcile differences. NOTE - community breaks at Lake Prevatt, particularly for any community downslope of the shrub swamp, are very different following a wet or dry period - consistent with discussion during the peer review site visit

   a. SJRWMD staff do an excellent job trying to understand a system prior to finalizing transect locations and collecting intensive data. As part of this initial assessment, consider identifying the most likely criteria to support the FH, MA, and FL levels. If the criteria will likely be the maximum or minimum elevation of a community then collect multiple point elevations for that vegetative community boundary to get a better average elevation of the maximum or minimum.

b. Alternately, collect the maximum and minimum elevations of all the communities at numerous locations using submeter GPS and use aerial interpretation along with the topobatymetric assessment to determine the maximum, mean, and minimum elevations for the vegetative communities and transitional area for the entire lake. This is a substantial shift in methodology but may be more representative of the overall lake.

   i. This approach may reduce variability in SWIDS data.

   ii. This approach would allow a graduate student to re-evaluate vegetation communities on prior MFLs lakes and incorporate a uniform vegetation classification system into the SWIDS analysis.

3. Consider including a table(s) showing communities, deep organic soils, and elevation statistics for the most relevant information for all three transects (e.g. Minimum Mesic Hammock, TZ, TSS, SS, mean HE/H, etc.).

4. Table C-13 - Transition Zone is not reflected in the table. The transition zone in these systems is typically a zone that is too wet for upland species and too dry for the development of a stable wetland community.

5. Considered a reduced soil sampling effort similar to CFWI: wetland boundary, hydric, hydric to surface, and muck at surface and add landward histic epipedon and landward histosol. The drawdown criteria commonly used for organic soils can be applied to the landward histosol (less conservative) or landward histic epipedon (more conservative) with the same ecological function of minimizing soil loss and consolidating organic materials during low water events.

   As previously discussed, and noted in the SJRWMD response to initial comments, collecting elevations of the extent of histic epipedon or histosol may skew the elevation lower since there is not a consistently defined stopping point for assessing the thickness of organic soils.

6. Consider revising the statement "Hydric and non-hydric soils were mapped for the Lake Prevatt watershed using USDA NRCS Soil Survey Geographic (SSURGO) GIS data…". Mapping has a specific meaning in Soil Survey. The mapping was completed by USDA, NRCS and digitized. The digitized data SSURGO was used to create a figure.

Surface Water Inundation/Dewatering Signatures (SWIDS)
The Surface Water Inundation/Dewatering Signatures (SWIDS) approach was modified for the Lake Prevatt MFLs reevaluation to lessen uncertainty by decreasing the range of frequencies for a given event. The Lake Prevatt approach uses both a Top-Down Method Cluster Approach for deep organic (MA) frequencies and a Transect Quadrat-level Bottom-Up Method Cluster Approach for vegetation and community frequencies. For the Top-Down Cluster Approach, the District used 28 lakes which were selected from the same Ward method hierarchical cluster group (grouped by similar hydrologic and landscape conditions) as Lake Prevatt and had the required deep organics information available for analysis. For the Transect Quadrat-level Bottom-Up Method Cluster Approach, the District used 29 lakes

including Lake Prevatt which had the required species coverage data and then assessed each transect's quadrat data concerning quadrat slope, percent exceedance of the quadrat's mean elevation, water level range (P10-P90), and the prevalence index (PI) of quadrat vegetation.

1. It takes significantly longer than 20 years to form a histic epipedon and histosol so use of the POR prior to data collection would be appropriate for SWIDS evaluation of HE/H. Twenty years may be more appropriate for evaluation of landward extent of muck (a more transient soil indicator). Consider using the landward most extent of histic epipedon and histosol which may reduce variability.
2. The effort to reduce variability in the SWIDS analysis is commendable. The use of a Cluster Approach seems appropriate.
   a. Are all of the other systems in the SWIDS analysis assessed with the same hydrologic data set (e.g., no pumping, existing conditions, restricted to a certain number of years, etc.) Consider reducing variability in SWIDS by, standardizing an approach for community breaks, standardizing community types/names, recapturing and collecting data on MFLs transects, and incorporating CFWI transects into the SWIDs analysis. Fund a MS student to collect this data with survey support. Fund a PhD student to evaluate lake clusters and develop best suite of variables.
   b. If a current staff member is not familiar with the cluster of systems in the Lake Prevatt cluster, consider having a staff member physically go to the lakes used for the SWIDS analysis to provided visual confirmation of similarity among the lakes to ensure the cluster analysis is providing a reasonable cluster for QA/QC purposes.
3. "Although many variables may influence the composition of vegetation communities, PI provides a way to condense the composition down to the variability caused by moisture availability." Consider if this should be cited and if moisture availability is the intended terminology.
4. Comparing each transect quadrat's variables for the Transect Quadrat-level Bottom-Up Method Cluster Approach seems appropriate.
   a. Consider adding a variable to capture the length of positive slope uphill of the transect or a combination of length of positive slope and percent slope. This addition may provide a better metric at the transect scale than soil drainage class around the lake
   b. Continue to experiment with variables to develop a consistent set of variables that work well or that are specifically customized to certain types of lakers.
5. Are the return intervals (RIs) calculated the same for MFL evaluations when a system is on the dry side of the SWIDS cluster. If the system is already on the dry side of the cluster the mean $\pm$ standard error of all observed RIs may make the system wetter. This is a methodology question and not directly related to the Lake Prevatt MFL reevaluation. Note that this comment was partially

addressed in the SJRWMD response to initial peer review comments but did not address how to deal with the RI for systems that are drier than the mean +/- 1 standard error.

6. When running the Top-Down Method Cluster Approach for deep organic (MA) frequencies consider using Kurtosis along with P10-P90 water level range rather than soil permeability. Soil permeability does not appear to responsive since all but 3 systems have > 80% of soils in high permeability class. Another way to evaluate soil permeability that may be more meaningful, would be to analyze the permeability of the most restrictive layer within the upper 2 meters of the soil profile.

MFL Metrics – Event-Based Metrics

1. The SJRWMD evaluated numerous other relevant event-based metrics following the initial peer review comments. Several of the additional metrics evaluated resulted in similar freeboard to the Hydroperiod Tool metrics. Initial peer review comments suggested that the SJRWMD should evaluate more sensitive environmental criteria, however the comment should have suggested to evaluate criteria that are ecologically relevant and better reflect the range of fluctuation of Lake Prevatt.
   a. The higher elevation event-based metrics are often the least sensitive but may be important to protect the upper fluctuation range of a system in certain scenarios.
   b. We stand by the comment that the most appropriate event-based criteria may not be applied to the MA and/or FL. The obvious reason is that the magnitude of the FL is higher than the magnitude of the MA. While durations and return intervals come into play, one would expect the magnitude of the FL to be lower than the MA.
      i. The return interval of the mean elevation of Shrub Swamp with a 180-day continuous non-exceedance event cannot be met under the no pumping scenario based on the RI derived from SWIDS analysis.
         a) Should average non-exceedance be evaluated since this is the MA?
         b) Does this suggest that the systems with Shrub Swamps that we are comparing with Lake Prevatt are less appropriate than we would like?
         c) Or does this just indicate that one of the most stable wetland communities at Lake Prevatt is not actually well tied to hydrology.
         d) Should a different statistic of the shrub swamp be evaluated?
         e) Sandhill lakes tend to accumulate organic soils at lower elevations due to the high range of fluctuation and frequent low water events. Would use of a soils-based criteria be more appropriate for the FL in this type of system?
      ii. A FL event-based metric based on soils criteria (Landward Histosol – 2ft) or Mean Histosol/Histic Epipedon with a 90-day continuous non-exceedance captures a little greater range of fluctuation for Lake Prevatt and result in similar UFA FB to the Open Water

Hydroperiod Tool Metric, 0.9 and 1.3 feet, respectively. Both of these criteria would have similar support in the literature for consolidation of organic materials and vegetative growth during the dry season. Dewatering of organic soils for relatively short durations regularly occur in unaltered systems. Should the soil criteria be applied for the FL since soils accumulate at lower elevations in sandhill system rather than vegetative criteria that has been noted to fluctuate much more rapidly?

c. SJRWMD staff and T. Richardson discussed the use of 0.3 ft drawdown in organic soils as more defensible than the 1.67 ft drawdown criteria and having more support in published literature. Much of the literature related to minimizing oxidation of organic soils is conducted in the everglades or other marsh or swamp systems with a much lower range of water level fluctuations. When considering that Lake Prevatt is a sandhill type lake with a large fluctuation range the use of organic soils for the FL may be more appropriate. Also, sandhill lakes tend to have fairly rapid water level fluctuations which may result in use of normal vegetative and soils criteria for the MA (i.e., durations and return intervals) not lining up well with the system hydrology.

MFL Metrics - Hydroperiod Tool Metrics

The MFL considered both event-based and the hydroperiod tool metrics. The event-based analyzes the minimum frequency of critical hydrologic events for long-term persistence of wetland and aquatic species as well as hydric soils. The hydroperiod tool evaluates elevation specific data to create new raster surfaces for different criteria. The hydroperiod tool is a meaningful data driven tool that allows comparison of habitat changes with changes in hydrologic regime. This is a fantastic tool for evaluation of WRVs as well as establishing critical habitat thresholds for MFLs. Average habitat area is appropriate for some assessments. Consider where the average habitat is not the best metric - what are critical elevations for certain metrics that should be evaluated? The SJRWMD evaluated numerous additional metrics for specific elevations under no-pumping, current pumping, and the MFLs condition. The additional metrics evaluated provide very strong evidence that the most limiting criteria have been applied to establish the MFL and that the Water Resource Values (WRVs) are protected.

1. The peer reviewers stand by comments that the change in area for certain criteria should be evaluated at specific elevations rather than the average elevation. SJRWMD completed assessments of multiple specific criteria/elevation as requested for consideration in the initial peer review comments. While these additional criteria were not the most limiting, the additional analysis provided for a better assessment of the WRVs.
2. The comment regarding water depth not being critical until water levels drop below 52 ft was specifically pertaining to the potential for fish kills. The full range of water level fluctuations are important for many wetland and water resource functions. The additional analysis has addressed this comment and demonstrated that the MFLs will not substantially increase low water events.
3. One consideration for significant harm is the loss of wetland area.

a. Does the change of 0.3% exceedance (No- pumping to MFLs condition) at the wetland elevation (57.6 ft) result in a loss of wetland area or just a change in vegetative composition?

b. What is the lake area at and below 57.6 ft NAVD compared with the lake area associated with an elevation with a 1.3% exceedance under the MFLs condition?

MFLs Determination

The MFLs determination for Lake Prevatt involved the evaluation of critical environmental features applying two different methods: an event-based approach and a hydroperiod tool approach. Using the event-based approach, a frequent high (FH) and a minimum average (MA) were established and involved determining a minimum hydroperiod to maintain key environmental features (e.g. transitional shrub swamp). The hydroperiod tool method utilized a stage-area analysis of the lake in relation to key lake habitat or recreational features (e.g. emergent marsh, open water, etc.).

Initial peer review comments regarding event-based and hydroperiod tool metrics were dominantly addressed by the SJRWMD response to initial comments. Some additional discussion/consideration is needed regarding the event-based metric applied (see MFL Metrics - Event-Based Metrics Comments). While some comments remain, sufficient data and analysis has been provided to demonstrate that the most appropriate and sensitive criteria has been applied to establish the recommended MFLs and that the recommended MFLs protect the WRVs associated with Lake Prevatt.

1. The following paragraphs should be included at the beginning of the Main MFLs Report and Appendix C.

   a. The MFLs assessment involves comparing the minimum metric condition for each metric with the hydrologic regime subject to impacts from current groundwater withdrawals (termed the current-pumping condition). This comparison determines whether each criterion at each system is being achieved under the current-pumping condition and if there is water available for additional withdrawal (freeboard), or whether water is necessary for recovery (deficit). If any of the MFLs environmental criteria are not being achieved under the current-pumping condition, indicating a deficit of water, a recovery strategy is necessary. If the MFLs are currently being achieved, but a deficit is projected within the 20-year planning horizon, a prevention strategy is needed. No-pumping and current-pumping condition water level datasets developed for Lake Prevatt were used to calculate freeboard or deficit and determine whether the system is in recovery, prevention, or neither (see Hydrological Analyses section above and Appendix B for more details).

   b. The MFLs determination for Lake Prevatt involved the evaluation of critical environmental features applying two different methods: an event-based approach and a hydroperiod tool approach. Using the event-based approach, a frequent high (FH) and a minimum average (MA) were established and involved determining a minimum hydroperiod to maintain key environmental features (e.g. transitional shrub swamp). The hydroperiod tool method utilized a stage-area analysis of the lake in relation to key lake habitat or recreational features (e.g. emergent marsh, open water, etc.).

2. Consider modifying/standardizing terminology and heading regarding the event-based metrics.
   a. e.g., Event-based metrics evaluated for the FH level
      i. The heading MA Level, FH Level, and FL Level are not exactly correct.
   b. With the addition of the hydroperiod tool and evaluating the most limiting metrics by freeboard or deficit more than one event-based metric per level may be appropriate to consider in some instances.

MFLs Status Assessment (Appendix D)
Based on a comparison of the Minimum Levels (Appendix C) scenario and the current pumping scenario, it was determined that the most constraining metric (open water 5 ft) has a UFA freeboard of 0.9 ft. The projected UFA drawdown to 2045 is 0.16 ft. Therefore, under current-pumping conditions, all Lake Prevatt MFLs are met. Assuming all future pumping is equal to the project 2045 water demand then there will be 0.74ft UFA freeboard in 2045. This implies that Lake Prevatt is not in prevention or recovery. The SJRWMD MFLs assessment methodology is well documented, defensible, and allows for assessment of the MFLs periodically during the water supply planning process. The determination of the available freeboard or deficit allow for various metrics allows for the most limiting metric to be used for the recommended MFLs.

Since the event-based metrics evaluated for the FH, MA, and FL were not the most constraining criteria, consider adding a statement in the Appendix to this fact as well as that the FH, MA, and FL are not the recommended minimum levels for clarification.

Water Resource Value Assessment (Appendix E)
The SJRWMD must consider “environmental values associated with coastal, estuarine, riverine, spring, aquatic, and wetlands ecology” when establishing MFLs. These environmental values are commonly referred to as water resource values. The SJRWMD approach is to protect the most sensitive WRVs and therefore ensure that all relevant Rule 62-40.473, F.A.C. environmental values are protected. The SJRWMD divided the 10 values identified by Rule into 3 groups based on their relevance to Lake Prevatt and also on whether they protect ecological versus non-ecological structure and function. Of the 10 WRVs, 3 were determined not relevant and the other 7 were determined to be protected based on the MFLs condition for protection of open water area (area ≥ 5 feet deep).

The SJRWMD provided additional analysis following the initial peer review comments. It is recommended that some of the additional analysis be incorporated into the WRV Assessment with respect to WRV1 (Recreation in and on the water) and WRV2 (Fish and wildlife habitat). The additional analysis utilizing the hydroperiod tool demonstrates that the open water area metric is the most sensitive criteria for establishing the recommended MFLs, and the criteria results in less than a 15% change in area for both average area available for canoeing (with 20” water depth) and lake area at low water levels (47.0 – 51.0 ft). In addition, the additional analysis demonstrates very little change in downstream discharge and only a 0.3% change in exceedance at the wetland boundary elevation established at the Central Florida Water Initiative transects.

Consider discussing WRV1 and WRV2 in their own categories. The additional analysis completed allows for a very clear assessment that these as well as all other WRVs (relevant to Lake Prevatt) are protected with the recommended MFLs and using the best available information.

Topobathymetric DEM Development (Appendix F)

The Topobathymetric DEM appears to be well developed and corrected with ground truthed data for different vegetative communities. It is thoroughly documented with the methodology clearly outlining steps for development of shoreline and upslope portions of the DEM. The data collection was comprehensive, utilizing various methodologies across several years and validated against survey data. The smoothing and stitching functions, NNI and “Mosaic to Raster” are reasonable for use leading to the final surface results, based on a review of the Appendix figures, to appear acceptable. No deficiencies were found in the Topobathymetric DEM development.

MFLs Main Report

The MFLs main report is a synthesis of the data and analyses presented in the appendices. Sufficient data and analyses are incorporated into the main report that a reader can use this as a stand-alone document or go to an appendix for more details and analysis. The peer reviewers consider this a good balance between the appendices and the main report.

1. See prior comments related to event-based metrics.
2. Work to have consistent terminology throughout this report and the appendices.
    a. Consider “Metric(s) evaluated for the FH level” rather than just Frequent High Level, Minimum Average Level, and Frequent Low Level.

CONCLUSION

1. <u>Assess validity and appropriateness of hydrological analyses.</u>
    - Are the hydrological data used to develop and assess environmental criteria adequate and appropriate?

        Yes, Models used are the industry standard and the ECFTX v. 2.0 has been peer reviewed and recalibrated for the Wekiva Springs contributing basin and Seminole County.

    - Are the hydrological analyses used to develop and assess environmental criteria appropriate?

        Yes, the SJRWMD provided additional rainfall analysis using the Standard Precipitation Index as well as other data and analysis to demonstrate that there is a substantial rainfall deficit post 1980. In addition, the ECFTX v. 2.0 model was recalibrated for the Wekiva Springs contributing basin and Seminole County. This model takes rainfall and climate data, hydrogeology, soils, water use, bathymetry, and other variables. The ECFTX v. 2.0 has been peer reviewed and represented the current best available tool for impact analysis of Lake Prevatt.

Additional rainfall analysis presented illustrates a significant difference in rainfall pre/post 1980. The detailed view of modeled lake stage for the current/no-pumping scenarios illustrates that there can be substantial change in lake level between the current/no-pumping when other factors line up just right but the effect appears to have a short duration. The short duration effect is not considered significant harm.

- Are assumptions reasonable and consistent given best available information?

  Yes

2. <u>Assess validity and appropriateness of environmental analyses and criteria.</u>

- Are the environmental data used to develop environmental criteria adequate and appropriate?

  Yes. The environmental data collected, the topobathy developed, and the vegetation mapping completed for Lake Prevatt are extensive and represent the onsite conditions. Comparison of the 2022 data with the 1997 MFLs data and the CFWI monitoring data are similar providing additional confidence that the data is accurate and representative of the system.

- Are the methods and procedures used to develop and assess environmental criteria appropriate?

  Yes. Clustering of lakes to allow for comparison of SWIDS for "like" systems and "like" transects is appropriate and an improvement from prior assessments. SWIDS ensure that appropriate return intervals are assigned to the event-based metrics. The addition of the Hydroperiod Tool criteria to assess additional metrics provides a better quantification of the effects of the MFLs regime and a direct way to evaluate WRVs. The 15% threshold seems acceptable and is the best criteria available. Some additional research into this threshold would be beneficial.

- Have all relevant environmental values been evaluated?

  Yes. SJRWMD completed additional analysis following the initial peer review comments to evaluate multiple additional metrics. The high water metrics (e.g. wetland boundary, discharge elevation, etc.) are not sensitive criteria but allow the peer reviewers to confidently say WRVs are protected.

- Are assumptions reasonable and consistent given best available information?

  Yes, and model improvements are made and water use data changes the SJRWMD will confirm that the recommended MFLs for Lake Prevatt are met when the 5-year water supply plan is developed.

3. Appropriateness of recommended MFLs:

- Are data used to support conclusions and recommendations adequate and appropriate?

  Yes, data and recommendations are adequate and appropriate. The additional analysis completed by SJRWMD following the initial peer review comments confirmed that the open water metric is the most restrictive criteria. The water level drawdown from Landward Histosol – 2 ft or the more conventional metric with a 1.67 ft drawdown from the mean elevation of deeper organic soils (histic epipedon/histosol) result in the same or slightly more UFA free board.

- Are the assumptions used and conclusions made in the development of protective minimum levels reasonable and appropriate given best available information?

  Yes, the assumptions, justification, and conclusions are thorough. The recommended MFLs are derived from the most restrictive criteria and allow for some change while preventing significant harm. Use of the hydroperiod tool allows for a direct evaluation of changes in area for specific criteria. This tool can be used to establish the recommended MFLs, Open Water criteria for Lake Prevatt, and also assess the WRVs.

STJOH-024-0002

ATTACHMENT A

LAKE PREVATT PEER REVIEW FINAL COMMENTS TABLE

APPENDIX B – HYDROLOGICAL ANALYSES

Section	Page	Comment
Groundwater Modeling	7	Figure B-5: Where are the larger use wells (public supply, agricultural, industrial) with respect to the buffer zones?
General	All	Consider tightening up terminology to make sure the reader can follow the analysis steps. For example, be sure to always specify between “simulated” vs “observed” or between “lake” vs “groundwater” levels. There were places in the text where it was not clear.
Background	2	In reference to model performance, what are meant by “reasonably” and “adequately”? What were the calibration criteria, i.e., what constitutes a “good” calibration?
Groundwater Modeling	6	How many/which cells were used to extract the model output data? What is the cell size? How does the cell size compare to the lake area?
Groundwater Modeling	6	Although these simple single linear equations provide a high correlation, using a weighted function (i.e., multi-part linear or polynomial) that separates out the pumping locations by distance seems like it would be more physically realistic. The wells closer to the lake would have more of an impact vs wells that are farther away.
Groundwater Modeling	6	However, it appears that using the linear approximation to represent the non-linear drawdown impacts is adequate in this case.
Groundwater Modeling	6-10	The regression analysis R^2 values are so high that it seems like it does not matter which buffer you use.
Groundwater Modeling	7	Would be helpful to have a figure that includes pumping well locations.
Groundwater Modeling	10	How does the 15-mile radius compare to the zone or radius of influence that would be calculated by the Theis equation for an average or maximum pumping rate for this region?
Groundwater Use	11	Related to filling the missing water use data, how well does the exponential growth assumption fit the periods where you do have historical data? Would be good to show or provide a comment here to confirm that this is a valid assumption.
Historical Impact on Groundwater Levels	13	Regarding the linear interpolation assumption to translate monthly data into daily, did you consider other interpolation methods (e.g., cubic spline) that might better capture seasonal behavior? Probably would not make much of a difference, but could be more realistic.
No-Pumping Condition Groundwater Levels	14	In reference to the “observed and estimated” groundwater levels near Lake Prevatt, how much of this data is observed, and how was it estimated.
Current-Pumping Condition Groundwater Levels	14	This is the first mention of return flows. Need to add a definition and describe how they are calculated.
Lake Level Datasets for MFL Analysis	17	Related to future climatic conditions, it would be helpful to add some information on the current state of climate modeling for the southeast US and possible future changes to the hydrology (more or less rain, higher temps, higher ET, etc.). Then describe how these possible changes might affect results. I agree that our understanding is limited, but I think some broad statements would be appropriate.

APPENDIX C – ENVIRONMENTAL METHODS, DATA, AND METRICS

Section	Page	Comment
Appendix C		This is a very large appendix that includes a mix of methods, field data, SWIDS analysis, Habitat metrics, Event Based SWIDS Frequencies, MA, FH, FL Assessment, and Event Based Metric Results. Consider breaking this down into 3 appendices or providing a Table of Contents and adjusting the document structure. The three appendices could include Methods, Environmental Data, and MFLs Metrics and Data Analysis.
Vegetation Sampling Procedures	4	SJRWMD's Vegetation Classification System (Kinser 2012) is a relatively simplified system and has substantially less detail on plant species, hydrology, and fire compared to FNAI Natural Communities. Consider shifting to FNAI or updated the SJRWMD Classification System with more detail and making it a Special Pub or Technical Pub). Conversion to FNAI system would have cascading effects and result in reworking a lot of data but it may be a valuable shift in methodology that is overdue.
Vegetation Sampling Procedures	4	Reasonable scientific judgement is highly variable depending on the experience of the individual. To minimize the potential error with this method it may be valuable to have each staff member present in the field (minimum 3) establish community boundaries and names independently and then reconcile differences. NOTE - community breaks at Lake Prevatt, particularly for any community downslope of the shrub swamp, are very different following a wet or dry period - consistent with discussion during the peer review site visit.
Soil Sampling Procedures	6	The extent of soil data collection seems excessive (unless there is a future use of the data that is not explained). The soils data other than HE/H are generally not incorporated into the MFLs. Considered a reduced soil sampling effort similar to CFWI: wetland boundary, hydric, hydric to surface, muck at surface and add landward HE, Landward H, plus the typical extent of HE/H. - Consistent with data reported in Table C-6
Lake Prevatt Mapped Wetland Community Data	8	Consider standardizing names in Table C-2/Figure C-2 with community names on transects. Oak Hammock = Mesic Hammock? Buttonbush Shrub = Shrub Swamp? Add an asterisk and footnote to Table C-2 for any communities not traversed by one or more transects (e.g. Mixed Hardwood - Oak Hammock). Consider a second footnote to identify upland communities - oak hammock and mixed hardwood-oak hammock could potentially be wetland or upland.
Transect 1 - Vegetation	13-15	Nuphar (SJRWMD Veg Classes - Kinser) and I believe Ware - Nuphar should be in deep marshes and be semi permanently to permanently flooded. Cover class 3 and 2 in Shallow marsh 1 and 2, respectively. Do the assigned vegetation communities reflect the drier conditions? Nuphar (depending on rhizome length is likely a much longer-lived species than herbs.)
Transect Summary	63	Table C-13 - Transition Zone is not reflected in the table. The transition zone in these systems is typically a zone that is too wet for upland species and too dry for the development of a stable wetland community.

ATTACHMENT A. PEER REVIEW OF LAKE PREVATT – FINAL COMMENTS TABLE

Section	Page	Comment
Surface Water Inundation/Dewatering Signatures (SWIDS)	67	I commend the effort to reduce variability in the SWIDS analysis. I agree with use of hydrologic data prior to vegetation and soil data collection. *It takes significantly longer than 20 years to form a histic epipedon and histosol, so use of the POR prior to data collection would be appropriate for SWIDS evaluation of HE/H but 20 years may be more appropriate for evaluation of landward extent of muck (a more transient soil indicator). See Richardson et. al. 2009 - use of the landward most extent of histic epipedon and histosol may also reduce variability since the mean elevation may consist of soils within the lake bed or at elevations that are always inundated.
Surface Water Inundation/Dewatering Signatures (SWIDS)	67+	Consider reducing variability in SWIDS by, standardizing an approach for community breaks, standardizing community types/names, recapturing and collecting data on MFLs transects, and incorporating CFWI transects into the SWIDs analysis. Fund a MS student to collect this data with survey support. Fund a PhD student to evaluate lake clusters and develop best suite of variables.
Surface Water Inundation/Dewatering Signatures (SWIDS)	68	Has a current or recent staff member physically gone to the Lake Prevatt clustered lakes used for the SWIDS analysis to provide a visual confirmation of similarity among the lakes - to ensure the cluster analysis is providing a reasonable cluster - a simple QA/QC.
Surface Water Inundation/Dewatering Signatures (SWIDS)	68-70	Is the hydrologic data being used for SWIDS consistently using a no-pumping or current pumping dataset? Which data set?
Transect Quadrat-level Cluster Approach	69	In addition to the quadrat level variables (Transect Quadrat-level Cluster Analysis) - consider adding a variable to capture the length of positive slope uphill of the transect or a combination of length of positive slope and percent slope. This will likely provide a better metric at the transect scale than soil drainage class around the lake.
Transect Quadrat-level Cluster Approach	68-69	General Comment - continue to experiment with variables to develop a consistent set of variables that work well or that are specifically customized to certain types of lakes.
Transect Quadrat-level Cluster Approach	68-69	Table C14 - Continue to adjust variables to improve the cluster analysis. Landscape soil drainage class and median depth to water table are directly related variables. Consider use of one or the other with different distances from the lake. Use of 100m may be better than 500m. In sandhill regions with steeper slopes it is common in the soil surveys to go from Candler (or similar -deep sandy well drained soil) to the lake. The scale does not capture variation between lake and xeric upland. Some county level soil surveys are much more detailed than others.
Cluster Approach – A top-down method for deep organic soils	70	Table C14 - The P90-P10 for Prevatt has the highest range - 8.55 followed by Smith 8.07. Does Smith meet its MFLs? Kurtosis is fairly high for a subset of lakes - would use of only kurtosis and P10-P90 give the same clustering result or only use of those water level statistics with landscape features?

ATTACHMENT A. PEER REVIEW OF LAKE PREVATT – FINAL COMMENTS TABLE

Section	Page	Comment
Transect Quadrat-level Cluster Approach – A Bottom-up Method for Vegetation and Community Frequencies	72	"Although many variables may influence the composition of vegetation communities, PI provides a way to condense the composition down to the variability caused by moisture availability." Consider if this should be cited and if moisture availability is the intended terminology.
Minimum Average (MA) Level (49.7 ft NAVD 88)	102	This is not the recommended MA level. Consider prior comments regarding terminology and headings.
Minimum Average (MA) Level (49.7 ft NAVD 88)	102	It was stated that organic soils do not provide good ecological data for setting levels in sandhill lakes – why use it them – other than to demonstrate that the MFLs established will prevent loss of those soils?
Duration	111	"Several months of flooding should be provided to ensure fish access to the floodplain and ensure nesting success (Knight et al. 1991)." -do you want to include this reference for a 30 day flooding event? This elevation may receive several months of flooding and the 30-day duration for this elevation may not be appropriate.
Event-based Metrics for Consideration	119	"…the FL at Lake Prevatt was not considered as a final event-based metric for consideration. Compared to the FH and MA, based on a longer-lived vegetation community (transitional shrub swamp composed of mainly buttonbush) and organic soils respectively, the FL may be considered a less reliable metric at Lake Prevatt. Such transient communities are not ideal for the creation of MFL metrics relying on long-term trends." Comment: While this boundary may be ephemeral (51.1 ft NAVD) it is similar to the Littoral Emergents/Lake bottom boundary in the 1997 memo about 50.6 or 49.6 NAVD88.
Hydroperiod Tool Metrics Results	120-121	The change in average habitat area is likely acceptable for the metrics with a flatter or weak bell-shaped distribution with changes in stage. The Open water metric is critical at lower stages and should be evaluated at specific stage elevations. Consider evaluating the canoe depth at a higher stage - for example at what distance is too far to frag a canoe from the shoreline to the water - at some low water stage no one is dragging a canoe to the water simply because there is not enough water. Maybe evaluate changes in canoe access from 52 - 56 at 0.5' increments?
End of Appendix C	121	With the heading: MFL Determinations for Lake Prevatt - Should there be a discussion of the actual recommended levels following the Hydroperiod Tool Metrics?

Table C-2. Lake Prevatt vegetation communities within 67.3 ft NAVD88 and their respective areas from 2021 aerial imagery.

Vegetation Community	Area (acres)
Deep Marsh – Floating	36.0
Oak Hammock	30.0
Open Water	26.0
Deep Marsh – Emergent	18.5
Buttonbush Shrub	11.1
Mixed Hardwood – Oak Hammock	3.5
Shallow Marsh	2.1
Willow Scrub-shrub	1.2
Disturbed (anthropogenic)	0.1

Table C-13. Summary statistics of all community types documented at Lake Prevatt environmental transects.

Community	Mean Minimum Elevation	Mean Elevation	Median Elevation	Mean Maximum Elevation
Mesic Hammock	57.0			
Transitional Shrub	53.3	53.8	53.7	54.3
Shrub Swamp	52. 2	52.7	53.0	53.6
Shallow Marsh	50.6	51.5	51.5	52.8
Deep Marsh	47.7	49.6	49.8	51.1
Deep Organics (A1, A2)	48.9*	50.0*	50.0*	51.3
*Based on data from Transect 1 only				

Table C-14. Ward's D clustering parameters and values for 28 SJRWMD lakes, including Lake Prevatt, used in minimum average return interval calculations. Spatial parameters were calculated within 500 m of each lake; tabular parameters were calculated on monthly values. Skewness and kurtosis were calculated on a 1-month lake stage change distribution. MCF (maximum cumulative fluctuation) index is a measure of lake fluctuation with a connection to the UFA.

Site	Water Level Range (ft)			Monthly Water Level Change Symmetry		Landscape Soil Drainage Class (% area)			UFA Connection		Median Depth to Water Table (ft)	Soil Permeability (% acres)		
	Lower (P80-P50)	Upper (P50-P20)	Total (P90-P10)	Skewness	Kurtosis	High	Moderate	Low	Lake-UFA Correlation Strength	MCF (ft)		High	Moderate	Low
Apshawa South	1.99	3.10	6.42	0.22	1.98	81.25	4.56	14.18	0.67	4.76	5.37	100.00	0.00	0.00
Ashby	0.57	1.01	2.70	1.22	5.84	0.00	3.52	96.48	0.91	1.26	3.20	82.70	8.05	9.25
Banana	1.58	1.32	3.81	0.72	0.69	43.45	35.92	20.63	0.84	4.77	9.88	92.02	7.98	0.00
Bowers	2.17	0.84	4.47	0.50	0.34	68.06	15.00	16.93	0.87	5.70	6.98	97.75	2.25	0.00
Cherry	1.28	0.73	3.21	0.48	0.59	62.47	5.75	31.78	0.74	3.13	11.89	95.66	1.66	2.68
Como	1.78	1.41	4.47	0.63	0.62	60.95	22.05	17.01	0.92	4.65	10.48	95.17	4.83	0.00
Cowpen	1.31	2.05	6.48	1.27	5.25	39.71	47.23	13.06	0.91	7.02	10.54	99.63	0.00	0.37
East Crystal	1.67	0.97	3.80	1.08	1.46	27.85	46.50	25.65	0.88	3.73	6.14	100.00	0.00	0.00
West Crystal	1.75	2.04	5.07	2.56	13.69	18.49	38.45	43.06	0.71	5.09	6.02	100.00	0.00	0.00
Daugharty	1.80	1.02	5.11	1.62	4.64	45.41	32.87	21.73	0.94	3.69	5.47	94.08	5.92	0.00
Dias	0.36	0.28	1.09	0.93	2.71	33.97	36.13	29.90	0.91	0.80	5.28	93.51	6.49	0.00
Gore	0.60	0.33	1.59	1.39	3.46	0.00	6.29	93.71	0.66	1.12	2.27	70.83	27.01	2.16
Halfmoon	2.41	1.36	6.46	0.96	1.74	40.90	6.07	53.03	0.80	6.46	2.01	98.01	1.99	0.00
Hopkins	1.25	1.00	3.54	1.22	3.38	49.91	16.43	33.66	0.74	2.69	2.16	96.55	3.45	0.00
Johns	1.96	1.36	4.64	1.50	3.22	57.80	14.49	27.71	0.81	2.61	4.21	96.60	3.40	0.00
Kerr	1.77	1.04	3.93	0.82	1.56	68.60	12.93	18.47	0.78	4.06	6.91	99.77	0.23	0.00
Little Como	1.97	1.83	5.14	1.43	13.90	79.37	14.03	6.60	0.91	3.23	11.36	100.00	0.00	0.00
Louisa	0.98	0.89	2.61	1.02	1.67	44.68	5.49	49.84	0.48	2.62	5.30	91.16	8.84	0.00

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Appendix C

Site	Water Level Range (ft)			Monthly Water Level Change Symmetry		Landscape Soil Drainage Class (% area)			UFA Connection		Median Depth to Water Table (ft)	Soil Permeability (% acres)		
	Lower (P80-P50)	Upper (P50-P20)	Total (P90-P10)	Skewness	Kurtosis	High	Moderate	Low	Lake-UFA Correlation Strength	MCF (ft)		High	Moderate	Low
Lochloosa	1.40	1.76	3.86	1.16	3.70	0.00	10.54	89.46	0.95	3.50	3.64	89.52	0.00	10.48
Prevatt	2.47	2.47	8.55	0.92	4.22	49.80	33.70	16.50	0.84	5.23	7.02	97.82	2.18	0.00
Purdom	1.57	0.48	2.97	0.65	2.30	59.25	5.73	35.02	0.89	2.93	3.65	89.73	10.27	0.00
Savannah	1.24	0.68	2.53	1.50	2.21	14.72	32.84	52.44	0.59	2.94	3.28	70.14	29.86	0.00
Smith	2.98	1.63	8.07	0.65	0.55	88.41	8.08	3.51	0.86	11.08	8.87	100.00	0.00	0.00
Swan	2.93	1.46	6.21	0.59	0.74	61.78	23.91	14.30	0.87	6.21	13.74	100.00	0.00	0.00
Sylvan	1.38	2.39	4.47	2.17	7.64	17.85	43.83	38.32	0.73	3.92	4.98	100.00	0.00	0.00
Trone	1.70	1.45	4.49	0.53	1.69	47.62	39.05	13.33	0.88	3.58	8.72	98.16	1.84	0.00
Weir	1.12	1.25	3.32	0.60	0.12	65.47	16.69	17.84	0.84	3.40	5.42	96.25	3.64	0.11
Winona	0.82	1.96	3.75	0.45	0.87	40.54	53.59	5.87	0.25	4.52	7.77	99.75	0.25	0.00

MINIMUM LEVELS REEVALUATION FOR LAKE PREVATT, ORANGE COUNTY

Section	Page	Comment
Mapped Vegetation	18	Table 7. Consider applying the same community names here as used in the MFLs transects. See additional Comments Appendix C
Mapped Hydric Soils	20	Hydric and non-hydric soils were mapped for the Lake Prevatt watershed using USDA NRCS Soil Survey Geographic (SSURGO) GIS data … Mapping has a specific meaning in Soil Survey. The mapping was completed by USDA, NRCS and digitized. The digitized data SSURGO was used to create a figure. Consider revising statement.
Environmental Analyses	32	"This process typically includes consideration of: • site-specific field-based ecological and soils data; • non-ecological environmental data (e.g., data used to assess recreational values);" Consider standardizing language throughout report and Appendices.
Environmental Criteria	32	introduce Habitat Area metrics with specific terminology. First evaluate event - based then evaluation habitat area metrics to determine the most sensitive criteria for establishing the MFL.
Event-Based Approach	34	"Due to the shallow morphology of the lake, Lake Prevatt maintains permanent wetland communities despite having highly fluctuating lake levels." -Consider that the permanent wetland communities are a function of the shallow morphology, but the Button bush shrub swamp may be a reflection of the lower lake level fluctuation range prior to 1975/1980 and the frequent high stages are sufficient to maintain (see later comment) the community (Button bush shrubs can live 50+ years). The lower wetland vegetation communities are "permanent" but highly variable in species composition due to fluctuating water levels. Has there been any direct first person description of the lake prior to 1975/1980 - there may have been a lot more open water (so lower vegetative communities may not be permanent). Statement is just a little too simplistic and too conclusive.
Site Selection and Data Collection	34-35	Include a table(s) showing communities, deep organic soils, and elevation statistics for the three transects.
FH Duration	37	Recommend citing wetland hydrologic requirements listed in 62-340.550 FAC as well.
MFLs Determination Summary	44	This paragraph should likely be in the Exec Summary, At the beginning of the MFLs main report, and near the beginning of Appendix C. "The MFLs determination for Lake Prevatt involved the evaluation of critical environmental features applying two different methods: an event-based approach and a hydroperiod tool approach. Using the event-based approach, a frequent high (FH) and a minimum average (MA) were established and involved determining a minimum hydroperiod to maintain key environmental features (e.g. transitional shrub swamp). The hydroperiod tool method utilized a stage-area analysis of the lake in relation to key lake habitat or recreational features (e.g. emergent marsh, open water, etc.). "
MFLs Determination Summary	46	Table 11 - at the top of the Table is it really the MFLs condition? It is just the transect data metric threshold. Since the MFLs is based on open water.

ATTACHMENT A. PEER REVIEW OF LAKE PREVATT – FINAL COMMENTS TABLE

Section	Page	Comment
MFLs Determination Summary	49	This paragraph seems to be the most concise description of the MFLs assessment. "The MFLs assessment involves comparing the minimum metric condition for each metric with the hydrologic regime subject to impacts from current groundwater withdrawals (termed the current-pumping condition). This comparison determines whether each criterion at each system is being achieved under the current-pumping condition and if there is water available for additional withdrawal (freeboard), or whether water is necessary for recovery (deficit). If any of the MFLs environmental criteria are not being achieved under the current-pumping condition, indicating a deficit of water, a recovery strategy is necessary. If the MFLs are currently being achieved, but a deficit is projected within the 20-year planning horizon, a prevention strategy is needed. No-pumping and current-pumping condition water level datasets developed for Lake Prevatt were used to calculate freeboard or deficit and determine whether the system is in recovery, prevention, or neither (see Hydrological Analyses section above and Appendix B for more details)."

Table 7. Lake Prevatt vegetation communities within 67.3 ft NAVD88 and their respective coverage from 2021 aerial imagery.

Vegetation Community	Area (acres)	Percent Area
Deep Marsh – Floating	36.0	28.0
Oak Hammock	30.0	23.3
Open Water	26.0	20.2
Deep Marsh – Emergent	18.5	14.4
Buttonbush Shrub	11.1	8.6
Mixed Hardwood – Oak Hammock	3.5	2.7
Shallow Marsh	2.1	1.6
Willow Scrub-shrub	1.2	0.9
Disturbed (anthropogenic)	0.1	0.0008
Total	**128.5**	**100**

Table 11. Summary of environmental criteria and MFLs condition for each criterion for Lake Prevatt.

Environmental Criterion	Environmental Value(s) Protected	MFLs Condition		
Event-based Metrics		**Level (ft)**	**Duration (days)**	**Return Interval (years)**
FH Average Transitional Shrub Swamp	Transitional shrub communities; fish and wildlife habitat	53.8	30	1.3
MA Mean elevation of organic soils minus 0.3 ft	Organic soils; seasonally flooded wetland habitat	49.7	180	3.5
Hydroperiod Tool Metrics		**No-pumping (average acres)**		**Minimum Metric Condition (15% reduction from NP condition)**
Small Waders	Fish and wildlife habitat	4.6		3.9
Large Waders	Fish and wildlife habitat	10.7		9.1
Game Fish Spawning	Fish and wildlife habitat	36.0		30.6
Emergent Vegetation	Fish and wildlife habitat	70.0		59.5
Canoe	Recreation/Aesthetics/Water Quality/Fish Habitat	66.9		56.9
Open Water	Recreation/Aesthetics/Water Quality/Fish Habitat	27.2		23.1
Lake Area	Recreation/Aesthetics/Water Quality/Fish Habitat	85.7		72.8

APPENDIX D – MFLS STATUS ASSESSMENT

Section	Page	Comment
Current Status Assessment	1	Consider adding a statement that the event based metric or ecological criteria evaluated for the FH, MA, and FL were not the most limiting criteria. As such, the FH, MA, and FL discussed are not the recommended minimum levels.
Frequent Low (FL)	5	Table D-1: Do you want to call this the MFLs condition when these are not the recommended MFLs
Frequent Low (FL)	5	Table D-1: I recommend adding the frequency of the No-Pumping condition to this table to be fully transparent.
Fish and Wildlife Metrics – Hydroperiod Tool	7	Average habitat area is likely not the most important comparison - depending on the metric and distribution of habitat vs. stage. If the habitat metrics are revised to compare average area for some and habitat area change at specific elevations for other metrics, revise text and tables as appropriate.
Event Based Metrics	9	Table D-3: The MA and FL criteria allow about a 50% increase in the frequency of low water events. Are the best metrics evaluated?

APPENDIX E – WATER RESOURCE VALUES (WRVS) ASSESSMENT

All Comments Addressed in the SJRWMD response to initial comments.

APPENDIX F – TOPOBATHYMETRIC DEM DEVELOPMENT FOR MFLS MODELING FOR LAKE PREVATT, ORANGE COUNTY, FLORIDA

No comments

ATTACHMENT B

LAKE PREVATT PEER REVIEW INITIAL COMMENTS TABLE

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

APPENDIX B – HYDROLOGICAL ANALYSES

Section	Page	Comment
Groundwater Modeling	7	Figure B-5: Where are the larger use wells (public supply, agricultural, industrial) with respect to the buffer zones?
Current-Pumping Condition Groundwater Levels	15	1997 MFLs report references a potentiometric surface at 25ft in Sept 1994 and at 30 ft May 1995. These values are not reflected in simulation - is the potentiometric surface (as noted in 1997 memo) equivalent/comparable to the UFA elevation in Figure B-11. If so why is there such a large difference. If not, why?
Lake Level Datasets for MFL Analysis	16	Figures B-12 and B-13: The 1997 MFLs report says the water level on July 30, 1997 was 48 ft (+/- 47 ft NAVD88). This does not seem to be reflected in the simulated stage data. How does the simulation compare with actual stage data - where are there differences and why? Statistics in Tables B-2 and B-3 appear to compare actual stage data "Historical Observed" with simulated data which have very similar descriptive statistics.
Lake Level Datasets for MFL Analysis	16	Figures B-12 and B-13: pre/post 1980 visually are quite different. Has there been any analysis of the rapid, large decreases in lake stage for those time periods (e.g., water budget of rainfall, groundwater inflow, PET)? This seems like it could be evaluated during multiple short period windows with little to no rainfall - is the dominant drop in lake stage due to PET?
Lake Level Datasets for MFL Analysis	16	Figures B-12 and B-13: Because of the drastic visual difference in the pre/post +/- 1980 stage it seems that an analysis of rainfall plotted with lake levels should be presented either here or in the MFLs status assessment. (e.g., 2 yr, 3yr, 4yr moving average of annual rainfall plotted with lake levels, cumulative rainfall assessment, double mass, water budget to show that rainfall and PET are dominant factors over downward leakance, or other appropriate analysis). This is a concern of the peer reviewers and was a public comment.
Lake Level Datasets for MFL Analysis	16	Are there any lakes in the region that do not have a strong connection to the UFA that show a more volatile hydrograph post 1970/1980? Or similar lakes for comparison?

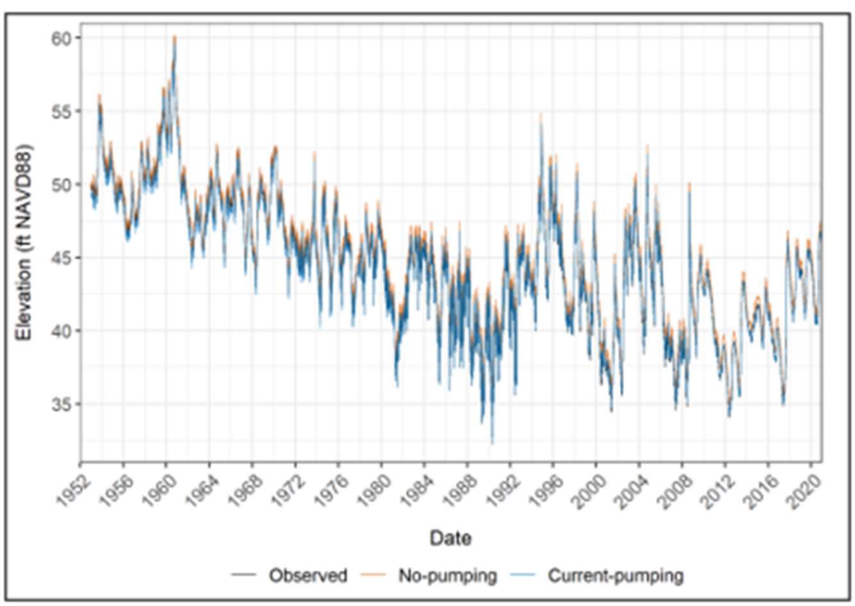

Figure B-11. ECFTX Observed (black), no-pumping (orange), and current-pumping (blue) condition of UFA levels near Lake Prevatt from groundwater use within 15-mile buffer.

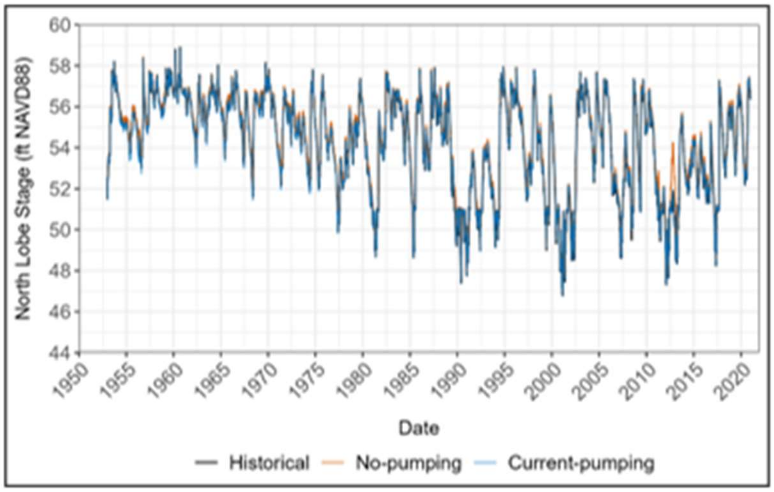

Figure B-12. Simulated stage levels of historical, no-pumping, and current-pumping at the North Lobe of Prevatt.

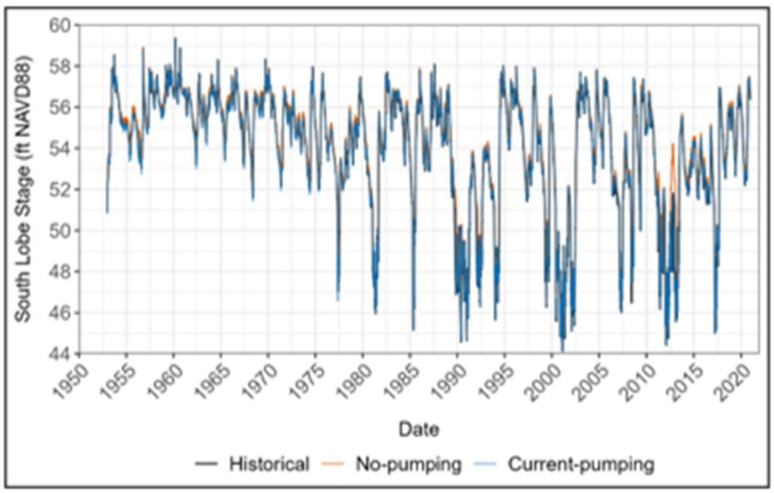

Figure B-13. Simulated stage levels of historical, no-pumping, and current-pumping at the South Lobe of Prevatt.

APPENDIX C – ENVIRONMENTAL METHODS, DATA, AND METRICS

Section	Page	Comment
Appendix C		This is a very large appendix that includes a mix of methods, field data, SWIDS analysis, Habitat metrics, Event Based SWIDS Frequencies, MA, FH, FL Assessment, and Event Based Metric Results. Consider breaking this down into 3 appendices or providing a Table of Contents and adjusting the document structure. The three appendices could include Methods, Environmental Data, and MFLs Metrics and Data Analysis.
Transect Site Selection	2	Is the following statement a correct description of the process? Is transect data collected to determine the location of the transects or is it more generalized data collection? “Ecological and environmental data were initially collected along linear transects, with many factors considered in the selection of transect locations.”
Transect Site Selection	2	The following sentence should likely say **MFLs transects**. “Transects are fixed sample lines across a water body or wetland and typically extend from uplands to open water.”
Vegetation Sampling Procedures	4	SJRWMD's Vegetation Classification System (Kinser 2012) is a relatively simplified system and has substantially less detail on plant species, hydrology, and fire compared to FNAI Natural Communities. Consider shifting to FNAI or updated the SJRWMD Classification System with more detail and making it a Special Pub or Technical Pub). Conversion to FNAI system would have cascading effects and result in reworking a lot of data but it may be a valuable shift in methodology that is overdue.
Vegetation Sampling Procedures	4	Were the line intercept data run through PCA to aid in establishing community breaks or was the data only collected? Without visualization the line intercept data is generally not very helpful to establish community breaks - but could provide value in the future for change assessment. (FNAI natural community plant composition could help define PCA community breaks)
Vegetation Sampling Procedures	4	Reasonable scientific judgement is highly variable depending on the experience of the individual. To minimize the potential error with this method it may be valuable to have each staff member present in the field (minimum 3) establish community boundaries and names independently and then reconcile differences. NOTE - community breaks at Lake Prevatt, particularly for any community downslope of the shrub swamp, are very different following a wet or dry period - consistent with discussion during the peer review site visit.
Soil Sampling Procedures	6	The extent of soil data collection seems excessive (unless there is a future use of the data that is not explained). The soils data other than HE/H are generally not incorporated into the MFLs. Considered a reduced soil sampling effort similar to CFWI: wetland boundary, hydric, hydric to surface, muck at surface and add landward HE, Landward H, plus the typical extent of HE/H. - Consistent with data reported in Table C-6
Lake Prevatt Mapped Wetland Community Data	8	Change “Wetland” to Vegetation
Lake Prevatt Mapped Wetland Community Data	8	"All communities visible in aerial imagery within a 67.3 ft NAVD88 elevation bound (128.5 acres) were mapped to encompass the range of water level fluctuation at the site." Please clarify the statement since lake fluctuation range rarely exceeds 58' (e.g. ... and the upland plant community adjacent to the lake)

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

Section	Page	Comment
Lake Prevatt Mapped Wetland Community Data	8	Consider standardizing names in Table C-2/Figure C-2 with community names on transects. Oak Hammock = Mesic Hammock? Buttonbush Shrub = Shrub Swamp? Add an asterisk and footnote to Table C-2 for any communities not traversed by one or more transects (e.g. Mixed Hardwood - Oak Hammock). Consider a second footnote to identify upland communities - oak hammock and mixed hardwood-oak hammock could potentially be wetland or upland.
Lake Prevatt Mapped Wetland Community Data	10	Are there any other historical aerials? Given the change in lake fluctuation range post +/- 1980 are there any records (records, historical accounts, early surveys or Florida) that show the lake as dry?
Transect 1	13-64	General Notes for future comments/discussion: comparisons using same datum: Min elevation of Mesic Hammock (current data 0.2, 2.2, 0.6 higher than 1997); Max shrub swamp (current data 1.5', 1.6', 1.9' lower than 1997 data); 0.5" muck (current data 1.25' and 1' lower than 1997 and T3 is 0.2' higher than 1997), Note for future discussion - CFWI wetland boundary (57.24, 58.12, 57.34) – 62-340 FAC wetland boundary is within Mesic Hammock on two transects; half inch muck (54.5, 54.54, 54.53)
Transect 1	14	Figure C-5 – Color code on Mesic Hammock extended 5 feet into Transition Zone.
Transect 1 - Vegetation	13-15	Nuphar (SJRWMD Veg Classes - Kinser) and I believe Ware - Nuphar should be in deep marshes and be semi permanently to permanently flooded. Cover class 3 and 2 in Shallow marsh 1 and 2, respectively. Do the assigned vegetation communities reflect the drier conditions? Nuphar (depending on rhizome length is likely a much longer-lived species than herbs.)
Transect Summary	63	Table C-13 - Transition Zone is not reflected in the table. The transition zone in these systems is typically a zone that is too wet for upland species and too dry for the development of a stable wetland community.
Surface Water Inundation/Dewatering Signatures (SWIDS)	67	I commend the effort to reduce variability in the SWIDS analysis. I agree with use of hydrologic data prior to vegetation and soil data collection. *It takes significantly longer than 20 years to form a histic epipedon and histosol, so use of the POR prior to data collection would be appropriate for SWIDS evaluation of HE/H but 20 years may be more appropriate for evaluation of landward extent of muck (a more transient soil indicator). See Richardson et. al. 2009 - use of the landward most extent of histic epipedon and histosol may also reduce variability since the mean elevation may consist of soils within the lake bed or at elevations that are always inundated.
Surface Water Inundation/Dewatering Signatures (SWIDS)	67+	Consider reducing variability in SWIDS by, standardizing an approach for community breaks, standardizing community types/names, recapturing and collecting data on MFLs transects, and incorporating CFWI transects into the SWIDs analysis. Fund a MS student to collect this data with survey support. Fund a PhD student to evaluate lake clusters and develop best suite of variables.

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

Section	Page	Comment
Surface Water Inundation/Dewatering Signatures (SWIDS)	68	Has a current or recent staff member physically gone to the Lake Prevatt clustered lakes used for the SWIDS analysis to provide a visual confirmation of similarity among the lakes - to ensure the cluster analysis is providing a reasonable cluster - a simple QA/QC.
Surface Water Inundation/Dewatering Signatures (SWIDS)	68-70	Is the hydrologic data being used for SWIDS consistently using a no-pumping or current pumping dataset? Which data set?
Transect Quadrat-level Cluster Approach	69	In addition to the quadrat level variables (Transect Quadrat-level Cluster Analysis) - consider adding a variable to capture the length of positive slope uphill of the transect or a combination of length of positive slope and percent slope. This will likely provide a better metric at the transect scale than soil drainage class around the lake.
Transect Quadrat-level Cluster Approach	68-69	General Comment - continue to experiment with variables to develop a consistent set of variables that work well or that are specifically customized to certain types of lakes.
Transect Quadrat-level Cluster Approach	68-69	Table C14 - Continue to adjust variables to improve the cluster analysis. Landscape soil drainage class and median depth to water table are directly related variables. Consider use of one or the other with different distances from the lake. Use of 100m may be better than 500m. In sandhill regions with steeper slopes it is common in the soil surveys to go from Candler (or similar -deep sandy well drained soil) to the lake. The scale does not capture variation between lake and xeric upland. Some county level soil surveys are much more detailed than others.
Cluster Approach – A top-down method for deep organic soils	70	Table C14 - The P90-P10 for Prevatt has the highest range - 8.55 followed by Smith 8.07. Does Smith meet its MFLs? Kurtosis is fairly high for a subset of lakes - would use of only kurtosis and P10-P90 give the same clustering result or only use of those water level statistics with landscape features?
Transect Quadrat-level Cluster Approach – A Bottom-up Method for Vegetation and Community Frequencies	72	"Although many variables may influence the composition of vegetation communities, PI provides a way to condense the composition down to the variability caused by moisture availability." Consider if this should be cited and if moisture availability is the intended terminology.
Transect Quadrat-level Cluster Approach – A Bottom-up Method for Vegetation and Community Frequencies and Return Interval Discussions	73	"After RIs were calculated for each site included in the PCA cluster, the final site RI was calculated by taking the mean ± standard error of all observed RIs. A mean + standard error was used for exceedance metrics and the mean - standard error for non-exceedance." Is this consistently applied in other MFLs? What about when the system is on the other side of the mean? Should the Median be used to minimize effects of "outliers"? Should a straight 15% reduction (for exceedance)/addition (non-exceedance) be applied to the frequency of the hydrologic signature for the no-pumping condition. See Habitat metrics for 15% threshold.

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

Section	Page	Comment
Fish and Wildlife Habitat Metric using the Hydroperiod Tool	74	The hydroperiod tool is a meaningful data driven tool that allows comparison of habitat changes with changes in hydrologic regime. This is a fantastic tool for evaluation of WRVs as well as establishing critical habitat thresholds for MFLs. Average habitat area is appropriate for some assessments. Consider where the average habitat is not the best metric - what are critical elevations for certain metrics that should be evaluated?
Average Habitat Area	77	This was previously discussed by email exchange. Consider adding further explanation of what is being done either here or at the end of Page 74 in: Fish and Wildlife Habitat Metrics Using the Hydroperiod Tool(this may be appropriate to add to the MFLs main report as well): The recommended MFLs are commonly based on the ecological transect data or a 15% reduction of a habitat metric whichever is more restrictive. The hydrologic requirements (magnitude, duration, and return interval) of the ecological data (vegetation community and soil characteristic statistics) are compared to the current pumping to determine the water available (freeboard) or water deficit. The hydroperiod tool is used to create hydrographs for each of the habitat metrics allowing for a 15% reduction in habitat area (i.e., the significant harm threshold). These hydrographs (add sentence or appropriate terminology - the hydrographs are not exactly what is compared) are compared to the current pumping condition to determine the freeboard or deficit associated with each habitat metric. The ecological transect data or habitat metric with the least freeboard or largest deficit is the most restrictive criteria used to establish the MFLs.
Average Habitat Area	77	"Assessment of habitat metrics is then simply the comparison of the average habitat area under no-pumping condition to the average habitat area under the current-pumping condition (see Appendix D for more details)." Should this statement be clarified: ...under current -pumping conditions to ensure that the 15% reduction in habitat is not exceeded under current conditions.
Average Habitat Area	77	The average habitat area may not be the most appropriate metric for determination of a 15% change in habitat. Consider adjusting to habitat area and stating that average habitat area is used for some metric while differences in area at specific stage elevations are used for other metrics to capture critical ecologic functions. For example, the 5 ft water depth is not really critical until water levels drop below 52 ft. What does the percent habitat change look like no-pumping vs. current condition in half ft increments: 52, 41.5, 41, ...
Average Habitat Area	77	What is the lake area change No-pumping vs. current for an elevation of 55.6' NAVD - to consider change in outflow to Carpenter Branch
Average Habitat Area	77	What is the change in lake area No-pumping vs. Current for a an elevation of 57.6' NAVD - to consider a change in wetland boundary.
Average Habitat Area	77	If a 15% reduction is habitat is a critical threshold for bird species richness is the 15% criteria just beyond the significant harm threshold?

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

Section	Page	Comment
Game Fish Spawning Habitat	78	Game fish (largemouth bass) previously occurred in Lake Prevatt based on notation of a fish kill at a water level of +/-47 ft NAVD88 (July 30, 1997) - noted in the 1997 Memo. So the 1 - 4 ft depth for game fish spawning is likely needed.
Canoe Depth	80	Consider that this should not be an evaluation of average area. How far will campers drag a canoe from the shoreline to access the lake. This should be an evaluation of a higher stage (maybe 100 feet from the shoreline of the camp near Transect 3)?
Open Water	80-81	The open water metric (lake area≥ 5 ft deep) should be evaluated at low water elevations. That is when it becomes critical. A change in the average open water area is not as meaningful. See prior comment.
Open Water	81-82	Consider removing this sentence (hopefully clarified in beginning of Hydroperiod Tool Discussion): “As with the fish and wildlife habitat metrics, assessment of the open-water metric is simply the comparison of the allowable average open-water area (15% reduction of area under no-pumping condition) to the average open-water area under the current-pumping condition (see Appendix D for more details).”
MFL Determinations for Lake Prevatt	83	"...is not typical of other sandhill-type lakes..." It is not consistent with the Keystone Heights/Lake Wales Ridge sandhill lakes but it is quite similar to numerous sandhill-intergrade lakes. It is on the spectrum between sandhill and stable with deep organic soils. Because lakes fall along this continuum, that provides justification for the cluster analysis for SWIDS.
MFL Determinations for Lake Prevatt	83	Should the heading be changed to: Data Analyzed for the MFLs Determination or similar. Recommended MFLs are not presented. Also, if the Hydroperiod tool will be evaluated for every MFLs determination then how the FH, MA, and FL (event-based) terminology is used. The terms Frequent High, Minimum Average, and Frequent Low convey that these are the MFLs being established/recommended. Consider **Transect Data Evaluated for** the Frequent High, MA, or FL.
Minimum Average	83+	Use of the mean elevation of soils with >8” of organics likely increases the variability in the SWIDs analysis by surveying to a lower stopping point depending on water levels, staff present, density and type of vegetation present. The lowest elevations surveyed for deep organic soils may rarely be dewatered. Consider an analysis using the landward extent of 8” organics or landward extent of 16” of organics – see Richardson et. al 2009 (Hydrologic Signature Analysis of Select Organic hydric Soil Indicators)
MFL Determinations for Lake Prevatt	83+	Given that the lake is and intergrade between sandhill and stable and given the fluctuation range the ecological data selected to represent the FH, MA, FL are not the most sensitive criteria. Consider the following as potentially more sensitive ecological criteria for this type of system: FH - Mean transition zone with 30-day duration, Mean Shrub Swamp 180 day non-ex, and Landward Histosol -0.61m for 30-90 days (see Richardson et al. 2009) or Mean H/HE-1.67 for FL
Minimum Average (MA) Level (49.7 ft NAVD 88)	102	This is not the recommended MA level. Consider prior comments regarding terminology and headings.

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

Section	Page	Comment
Minimum Average (MA) Level (49.7 ft NAVD 88)	102	It was stated that organic soils do not provide good ecological data for setting levels in sandhill lakes – why use it them – other than to demonstrate that the MFLs established will prevent loss of those soils?
Frequent High (FH) Level (53.8 ft NAVD 88)	109	Consider a more sensitive criteria given the lake type and adjust the duration and return interval. E.g., transition zone. In this type of lakes the shoreline or transition zone go from inundated (killing upland plants that have encroached) to very dry allowing recruitment of upland plants. The duration needed to kill mature pine trees could be extracted from Lake Sylvan stage data (pines may have been killed following 2004 hurricane season?) Or use the wetland boundary (as Infrequent high) (see CFWI transects) with minimum hydrology required to meet the wetland definition as a measure of significant harm. see 62-340.550 FAC (inundation for 7 continuous days or saturation for 20 continuous days)
Frequent High (FH) Level (53.8 ft NAVD 88)	109	Landward elevation of muck (corrected for datum) is 54.6 in 1997 memo and 54.5 in CFWI transects. And could also be a representative elevation for the FH with a little less frequent return interval. Not that everything should be based on soils but what represents and appropriate elevation to be inundated for 30 continuous days. This could also be used as supporting evidence.
Duration	111	"Several months of flooding should be provided to ensure fish access to the floodplain and ensure nesting success (Knight et al. 1991)." -do you want to include this reference for a 30 day flooding event? This elevation may receive several months of flooding and the 30-day duration for this elevation may not be appropriate.
Event-based Metrics for Consideration	119	"…the FL at Lake Prevatt was not considered as a final event-based metric for consideration. Compared to the FH and MA, based on a longer-lived vegetation community (transitional shrub swamp composed of mainly buttonbush) and organic soils respectively, the FL may be considered a less reliable metric at Lake Prevatt. Such transient communities are not ideal for the creation of MFL metrics relying on long-term trends." Comment: While this boundary may be ephemeral (51.1 ft NAVD) it is similar to the Littoral Emergents/Lake bottom boundary in the 1997 memo about 50.6 or 49.6 NAVD88.
Hydroperiod Tool Metrics Results	119	Figure C-27 - I recommend shading out elevation above the max lake fluctuation and noting such.
Hydroperiod Tool Metrics Results	120-121	The change in average habitat area is likely acceptable for the metrics with a flatter or weak bell shaped distribution with changes in stage. The Open water metric is critical at lower stages and should be evaluated at specific stage elevations. Consider evaluating the canoe depth at a higher stage - for example at what distance is too far to frag a canoe from the shoreline to the water - at some low water stage no one is dragging a canoe to the water simply because there is not enough water. Maybe evaluate changes in canoe access from 52 - 56 at 0.5' increments?
End of Appendix C	121	With the heading: MFL Determinations for Lake Prevatt - Should there be a discussion of the actual recommended levels following the Hydroperiod Tool Metrics?

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

Table C-2. Lake Prevatt vegetation communities within 67.3 ft NAVD88 and their respective areas from 2021 aerial imagery.

Vegetation Community	Area (acres)
Deep Marsh – Floating	36.0
Oak Hammock	30.0
Open Water	26.0
Deep Marsh – Emergent	18.5
Buttonbush Shrub	11.1
Mixed Hardwood – Oak Hammock	3.5
Shallow Marsh	2.1
Willow Scrub-shrub	1.2
Disturbed (anthropogenic)	0.1

Table C-13. Summary statistics of all community types documented at Lake Prevatt environmental transects.

Community	Mean Minimum Elevation	Mean Elevation	Median Elevation	Mean Maximum Elevation
Mesic Hammock	57.0			
Transitional Shrub	53.3	53.8	53.7	54.3
Shrub Swamp	52. 2	52.7	53.0	53.6
Shallow Marsh	50.6	51.5	51.5	52.8
Deep Marsh	47.7	49.6	49.8	51.1
Deep Organics (A1, A2)	48.9*	50.0*	50.0*	51.3
*Based on data from Transect 1 only				

Table C-14. Ward's D clustering parameters and values for 28 SJRWMD lakes, including Lake Prevatt, used in minimum average return interval calculations. Spatial parameters were calculated within 500 m of each lake; tabular parameters were calculated on monthly values. Skewness and kurtosis were calculated on a 1-month lake stage change distribution. MCF (maximum cumulative fluctuation) index is a measure of lake fluctuation with a connection to the UFA.

Site	Water Level Range (ft)			Monthly Water Level Change Symmetry		Landscape Soil Drainage Class (% area)			UFA Connection		Median Depth to Water Table (ft)	Soil Permeability (% acres)		
	Lower (P80-P50)	Upper (P50-P20)	Total (P90-P10)	Skewness	Kurtosis	High	Moderate	Low	Lake-UFA Correlation Strength	MCF (ft)		High	Moderate	Low
Apshawa South	1.99	3.10	6.42	0.22	1.98	81.25	4.56	14.18	0.67	4.76	5.37	100.00	0.00	0.00
Ashby	0.57	1.01	2.70	1.22	5.84	0.00	3.52	96.48	0.91	1.26	3.20	82.70	8.05	9.25
Banana	1.58	1.32	3.81	0.72	0.69	43.45	35.92	20.63	0.84	4.77	9.88	92.02	7.98	0.00
Bowers	2.17	0.84	4.47	0.50	0.34	68.06	15.00	16.93	0.87	5.70	6.98	97.75	2.25	0.00
Cherry	1.28	0.73	3.21	0.48	0.59	62.47	5.75	31.78	0.74	3.13	11.89	95.66	1.66	2.68
Como	1.78	1.41	4.47	0.63	0.62	60.95	22.05	17.01	0.92	4.65	10.48	95.17	4.83	0.00
Cowpen	1.31	2.05	6.48	1.27	5.25	39.71	47.23	13.06	0.91	7.02	10.54	99.63	0.00	0.37
East Crystal	1.67	0.97	3.80	1.08	1.46	27.85	46.50	25.65	0.88	3.73	6.14	100.00	0.00	0.00
West Crystal	1.75	2.04	5.07	2.56	13.69	18.49	38.45	43.06	0.71	5.09	6.02	100.00	0.00	0.00
Daugharty	1.80	1.02	5.11	1.62	4.64	45.41	32.87	21.73	0.94	3.69	5.47	94.08	5.92	0.00
Dias	0.36	0.28	1.09	0.93	2.71	33.97	36.13	29.90	0.91	0.80	5.28	93.51	6.49	0.00
Gore	0.60	0.33	1.59	1.39	3.46	0.00	6.29	93.71	0.66	1.12	2.27	70.83	27.01	2.16
Halfmoon	2.41	1.36	6.46	0.96	1.74	40.90	6.07	53.03	0.80	6.46	2.01	98.01	1.99	0.00
Hopkins	1.25	1.00	3.54	1.22	3.38	49.91	16.43	33.66	0.74	2.69	2.16	96.55	3.45	0.00
Johns	1.96	1.36	4.64	1.50	3.22	57.80	14.49	27.71	0.81	2.61	4.21	96.60	3.40	0.00
Kerr	1.77	1.04	3.93	0.82	1.56	68.60	12.93	18.47	0.78	4.06	6.91	99.77	0.23	0.00
Little Como	1.97	1.83	5.14	1.43	13.90	79.37	14.03	6.60	0.91	3.23	11.36	100.00	0.00	0.00
Louisa	0.98	0.89	2.61	1.02	1.67	44.68	5.49	49.84	0.48	2.62	5.30	91.16	8.84	0.00

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Appendix C

Site	Water Level Range (ft)			Monthly Water Level Change Symmetry		Landscape Soil Drainage Class (% area)			UFA Connection		Median Depth to Water Table (ft)	Soil Permeability (% acres)		
	Lower (P80-P50)	Upper (P50-P20)	Total (P90-P10)	Skewness	Kurtosis	High	Moderate	Low	Lake-UFA Correlation Strength	MCF (ft)		High	Moderate	Low
Lochloosa	1.40	1.76	3.86	1.16	3.70	0.00	10.54	89.46	0.95	3.50	3.64	89.52	0.00	10.48
Prevatt	2.47	2.47	8.55	0.92	4.22	49.80	33.70	16.50	0.84	5.23	7.02	97.82	2.18	0.00
Purdom	1.57	0.48	2.97	0.65	2.30	59.25	5.73	35.02	0.89	2.93	3.65	89.73	10.27	0.00
Savannah	1.24	0.68	2.53	1.50	2.21	14.72	32.84	52.44	0.59	2.94	3.28	70.14	29.86	0.00
Smith	2.98	1.63	8.07	0.65	0.55	88.41	8.08	3.51	0.86	11.08	8.87	100.00	0.00	0.00
Swan	2.93	1.46	6.21	0.59	0.74	61.78	23.91	14.30	0.87	6.21	13.74	100.00	0.00	0.00
Sylvan	1.38	2.39	4.47	2.17	7.64	17.85	43.83	38.32	0.73	3.92	4.98	100.00	0.00	0.00
Trone	1.70	1.45	4.49	0.53	1.69	47.62	39.05	13.33	0.88	3.58	8.72	98.16	1.84	0.00
Weir	1.12	1.25	3.32	0.60	0.12	65.47	16.69	17.84	0.84	3.40	5.42	96.25	3.64	0.11
Winona	0.82	1.96	3.75	0.45	0.87	40.54	53.59	5.87	0.25	4.52	7.77	99.75	0.25	0.00

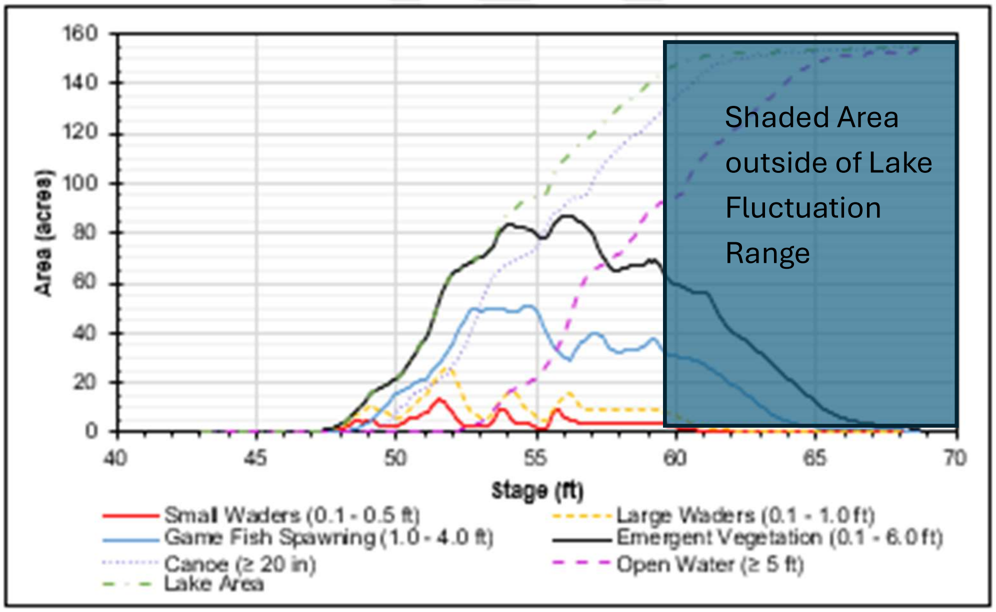

Figure C-27: Stage-area trends for Lake Prevatt hydroperiod tool metrics.

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

MINIMUM LEVELS REEVALUATION FOR LAKE PREVATT, ORANGE COUNTY

Section	Page	Comment
Executive Summary		Is the adopted MFL met under current conditions
Executive Summary	Paragraph 5. Last Sentence	“Once all metrics are evaluated, the most limiting metric(s), in terms of available water, form(s) the basis of the overall MFL.” change overall MFL to …basis of the MFLs recommendation. (same comment on Page 3)
Executive Summary		The lake fluctuation range is +/- 12 ft - the recommended MFLs only cover a range of 3.6 ft. Should a P10 and P90 also be considered?
Executive Summary		Does the use of these percentiles have any effect on potential future enforcement, is the duration and frequency component lost, can low levels be exacerbated without effecting the P25, P50, and P75, since water demand is higher during drought conditions.
SJRWMD MFLs Program Overview	3	Label the "other" metrics - maybe "water resource metrics" so that consistent terminology can be used throughout main report and appendices. (Maybe change event-based metrics to Transect metrics so that it is more meaningful)
SJRWMD MFLs Program Overview	3	"Finally, the MFL current status is compared to future water use withdrawal projections to determine future status. " the MFL Current status? Consider - Finally, the MFLs condition (or MFLs hydrologic regime or MFLs freeboard) is compared to future water use withdrawal projections to determine future status.
Mapped Vegetation	16	Wetland communities within an elevation contour of 67.3 ft… Change "Wetland" to "Vegetation"
Mapped Vegetation	18	Table 7. Consider applying the same community names here as used in the MFLs transects. See additional Comments Appendix C
Mapped Hydric Soils	20	Hydric and non-hydric soils were mapped for the Lake Prevatt watershed using USDA NRCS Soil Survey Geographic (SSURGO) GIS data … Mapping has a specific meaning in Soil Survey. The mapping was completed by USDA, NRCS and digitized. The digitized data SSURGO was used to create a figure. Consider revising statement.
No-pumping and Current-pumping Condition water levels	29-30	Is the north lobe Historical, No-Pumping, Current Pumping hydrograph and exceedance curve of simulated data similar to the south lobe?
Environmental Analyses	32	"This process typically includes consideration of: • site-specific field-based ecological and soils data; • non-ecological environmental data (e.g., data used to assess recreational values);" Consider standardizing language throughout report and Appendices.
Environmental Criteria	32	introduce Habitat Area metrics with specific terminology. First evaluate event - based then evaluation habitat area metrics to determine the most sensitive criteria for establishing the MFL.
Environmental Criteria	32	"The final recommended environmental metrics, used to establish minimum levels for Lake Prevatt, are described below. " Consider - The transect data metrics and habitat area metrics evaluated to establish the minimum levels for Lake Prevatt…

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

Section	Page	Comment
Event-Based Approach	34	"Due to the shallow morphology of the lake, Lake Prevatt maintains permanent wetland communities despite having highly fluctuating lake levels." -Consider that the permanent wetland communities are a function of the shallow morphology, but the Button bush shrub swamp may be a reflection of the lower lake level fluctuation range prior to 1975/1980 and the frequent high stages are sufficient to maintain (see later comment) the community (Button bush shrubs can live 50+ years). The lower wetland vegetation communities are "permanent" but highly variable in species composition due to fluctuating water levels. Has there been any direct first person description of the lake prior to 1975/1980 - there may have been a lot more open water (so lower vegetative communities may not be permanent). Statement is just a little too simplistic and too conclusive.
Site Selection and Data Collection	34-35	Include a table(s) showing communities, deep organic soils, and elevation statistics for the three transects.
Minimum Frequent High (FH)	36-41	Consider terminology used - since the event based metrics do not result in the recommended MFLs it is confusing to call the event based levels FH, MA, and FL.
FH Magnitude	36	The mean of the max elevations of the transitional shrub swamp community is 0.7 ft lower than the max of the shrub swamp community in the 1997 memo. (same elevation shift when comparing just the replication of the 1997 transect)
FH Magnitude	36	Consider that the max elevation of this community should be considered for the FH not the mean. Per Kinser - "Hydrology similar to that of cypress, hardwood swamp, or shallow marsh communities."
FH Duration	37	Recommend citing wetland hydrologic requirements listed in 62-340.550 FAC as well.
FH Duration	37	"In addition, the 30-day flooding duration is sufficient to cause the mortality of young upland plant species that have become established in the transitional shrub swamps during low water events, maintaining the hydrophytic structure and diversity (Ahlgren and Hansen 1957; Menges and Marks 2008)." - The concern at Lake Prevatt should not be the mortality of young upland plants in the TSS this process is likely dominant in the TZ. If the TSS abuts the upland then the TSS would likely have a slightly different community structure and killing upland species would be more relevant.
MA Magnitude	38	Consider the mean elevation of SS as the MA level. Based on Kinser description of the hydrology of this community it would seem to be an appropriate elevation for the MA level.
MA Magnitude	39	Consider evaluating the landward most elevation (generally the max elevation) of histic epipedon and histosol. This may reduce variability in the SWIDS analysis by not incorporating lower elevation organics in what may be considered lake bed. See Richardson et al. 2009.
Frequent Low (FL)	41	"Please see Appendix C for more information on the FL and Appendix D for a comparison of the FL assessment with other metrics." - There is not a comparison of or discussion of the FL assessment with respect to other metrics in Appendix D. I don't know that one is necessary.

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

Section	Page	Comment
Frequent Low (FL)	40-41	While the maximum elevation of deep marsh would normally be appropriate for a FL level for lakes with a lower fluctuation range an allowable drawdown for organic soils may be more appropriate here.
Frequent Low (FL)	41	"Therefore, while still assessed and discussed in appendices, the FL at Lake Prevatt was not considered as a final event-based metric. Compared to the FH and MA, based on a longer-lived vegetation community (transitional shrub swamp composed of mainly buttonbush) and organic soils respectively, the FL may be considered a less reliable metric at Lake Prevatt. Such transient communities are not ideal for the creation of MFL metrics relying on long-term trends." - Previous statement - the shallow morphology of the lake allows for permanent wetland communities. Also - The max elevation of Deep marsh 51.1 lines up pretty well with the Emergent Aquatic bed from 1997 memo (51.0 ft NAVD)
Hydroperiod Tool – Fish and Wildlife Habitat Metrics	41	"In an effort to ensure that MFLs developed for Lake Prevatt will adequately protect all relevant ecological and human-use values, it was deemed prudent to develop other metrics to augment the event-based criteria described above." - It seems that the use of the Hydroperiod tool and development of "other metrics" would become part of the standard MFLs methodology and be considered on every MFL determination. This may affect the document structure and terminology used.
Hydroperiod Tool – Fish and Wildlife Habitat Metrics	41	Munson and Delfino 2007 also note that a 15% change in the temporal component is more conservative than a 15% change in area. Though change in area provides a direct way to evaluate WRVs.
Hydroperiod Tool – Fish and Wildlife Habitat Metrics	41-42	Average habitat area is likely not the most important comparison - depending on the metric and distribution of habitat vs. stage. Consider revising the habitat metrics to compare the average area for some and habitat change at specific elevations for other metrics. Revise report and appendices as appropriate. (See Detailed Comments Appendix C)
Nearshore Fish and Wildlife Habitat	43	Figure 25 - Shade out area to the right of max lake stage (outside of lake fluctuation range)
MFLs Determination Summary	44	This paragraph should likely be in the Exec Summary, At the beginning of the MFLs main report, and near the beginning of Appendix C. "The MFLs determination for Lake Prevatt involved the evaluation of critical environmental features applying two different methods: an event-based approach and a hydroperiod tool approach. Using the event-based approach, a frequent high (FH) and a minimum average (MA) were established and involved determining a minimum hydroperiod to maintain key environmental features (e.g. transitional shrub swamp). The hydroperiod tool method utilized a stage-area analysis of the lake in relation to key lake habitat or recreational features (e.g. emergent marsh, open water, etc.). "
MFLs Determination Summary	46	Table 11 - at the top of the Table is it really the MFLs condition? It is just the transect data metric threshold. Since the MFLs is based on open water.

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

Section	Page	Comment
MFLs Determination Summary	49	This paragraph seems to be the most concise description of the MFLs assessment. "The MFLs assessment involves comparing the minimum metric condition for each metric with the hydrologic regime subject to impacts from current groundwater withdrawals (termed the current-pumping condition). This comparison determines whether each criterion at each system is being achieved under the current-pumping condition and if there is water available for additional withdrawal (freeboard), or whether water is necessary for recovery (deficit). If any of the MFLs environmental criteria are not being achieved under the current-pumping condition, indicating a deficit of water, a recovery strategy is necessary. If the MFLs are currently being achieved, but a deficit is projected within the 20-year planning horizon, a prevention strategy is needed. No-pumping and current-pumping condition water level datasets developed for Lake Prevatt were used to calculate freeboard or deficit and determine whether the system is in recovery, prevention, or neither (see Hydrological Analyses section above and Appendix B for more details)."
Minimum Average (MA)	50	MA level allows for a +/- 50% increase in the number of dry events No-pumping to MA. This increase in the number of dry events likely will not sustain the organic soils in this system. This is not the basis for the recommended MFLs but we should be questioning if the most sensitive ecological criteria have been evaluated.
Group 2: WRV 2, WRV 4, WRV 5, and WRV 7	52	Group 2 WRVs (2, 4, 5, 7) - fish and wildlife habitats and the passage of fish. It is not clear that this WRV is protected. Evaluation of open water area (5 ft or deeper) at lower lake stages is needed to demonstrate that this WRV is protected. (see additional comments in Appendix C).
Group 3: WRV 1, WRV 6, and WRV 9	53	Group 3 WRVs (1, 6, 9) - recreation in and on the water. It is not clear that this WRV is protected. Evaluation of canoe depth (20") should be evaluated at specific stages to demonstrate that this WRV is protected. (see additional comments in Appendix C)
Recommended Minimum Levels	56	"Three minimum levels, a minimum P25, P50, and P75, are recommended for Lake Prevatt (Figure 26; Table 15). These three percentiles were calculated from the MFLs condition lake-level time series data. This is the lake-level time series is based on the protection of open-water habitat, and is associated with a UFA freeboard of 0.9 ft (Figure 27; Table 12). Adopting these three minimum levels will ensure the protection of the minimum hydrologic regime at low, average, and high levels for Lake Prevatt. " Change to "The or This" or This is the lake-level time series based on…
Recommended Minimum Levels	56	Recommended levels represent a 3.6 ft fluctuation range when the lake fluctuates 12-15'. Should additional P values be represented? Does this protect the temporal components. Does use of P values effect potential enforcement. Low lake levels are likely the most critical for fish habitat and susceptible to UFA drawdown. These P values do not seem to address low lake levels.
Recommended Minimum Levels	57	P25 - elevation lines up in the TZ, P50 lines up with Max TSS, P75 lines up with max SM. Again this suggests that most sensitive ecological transect data was not applied.

Table 7. Lake Prevatt vegetation communities within 67.3 ft NAVD88 and their respective coverage from 2021 aerial imagery.

Vegetation Community	Area (acres)	Percent Area
Deep Marsh – Floating	36.0	28.0
Oak Hammock	30.0	23.3
Open Water	26.0	20.2
Deep Marsh – Emergent	18.5	14.4
Buttonbush Shrub	11.1	8.6
Mixed Hardwood – Oak Hammock	3.5	2.7
Shallow Marsh	2.1	1.6
Willow Scrub-shrub	1.2	0.9
Disturbed (anthropogenic)	0.1	0.0008
Total	**128.5**	**100**

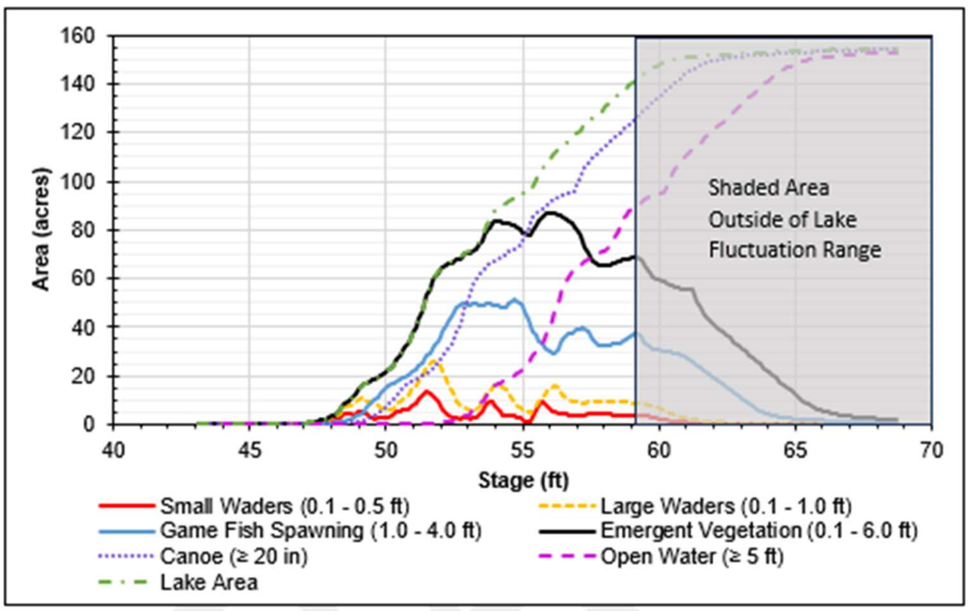

Figure 25. Stage-area trends for Lake Prevatt hydroperiod tool metrics.

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

Table 11. Summary of environmental criteria and MFLs condition for each criterion for Lake Prevatt.

Environmental Criterion	**Environmental Value(s) Protected**	**MFLs Condition**		
Event-based Metrics		**Level (ft)**	**Duration (days)**	**Return Interval (years)**
FH Average Transitional Shrub Swamp	Transitional shrub communities; fish and wildlife habitat	53.8	30	1.3
MA Mean elevation of organic soils minus 0.3 ft	Organic soils; seasonally flooded wetland habitat	49.7	180	3.5
Hydroperiod Tool Metrics		**No-pumping (average acres)**		**Minimum Metric Condition (15% reduction from NP condition)**
Small Waders	Fish and wildlife habitat	4.6		3.9
Large Waders	Fish and wildlife habitat	10.7		9.1
Game Fish Spawning	Fish and wildlife habitat	36.0		30.6
Emergent Vegetation	Fish and wildlife habitat	70.0		59.5
Canoe	Recreation/Aesthetics/Water Quality/Fish Habitat	66.9		56.9
Open Water	Recreation/Aesthetics/Water Quality/Fish Habitat	27.2		23.1
Lake Area	Recreation/Aesthetics/Water Quality/Fish Habitat	85.7		72.8

ATTACHMENT B. PEER REVIEW OF LAKE PREVATT INITIAL FINDINGS

WRV	Environmental Criteria Evaluated	Protected by the MFLs Condition?
Recreation in and on the water	Canoe paddling depth	Yes
Fish and wildlife habitats and the passage of fish	FH, MA, small wader habitat, large wader habitat, game fish spawning habitat, emergent marsh vegetation, and open water	Yes
Estuarine resources	As the lake is land locked and has no surface water connection to estuarine resources, this environmental value is not relevant.	NA
Transfer of detrital material	Compliance with the recommended FH provides for the protection of flooding events necessary for the transfer of detrital material at Lake Prevatt.	Yes
Maintenance of freshwater storage and supply	Because the overall purpose of the event-based MFLs, hydroperiod tool metrics, and other WRVs is to protect environmental resources, and other non-consumptive beneficial uses while also providing for consumptive uses, this environmental value is considered protected if the remaining relevant values are protected.	Yes
Aesthetic and scenic attributes	Lake area and open water metrics	Yes
Filtration and absorption of nutrients and other pollutants	Compliance with the recommended FH and MA levels provides for the protection of wetland communities which will maintain filtration and absorption of nutrients and other pollutants at Lake Prevatt.	Yes
Sediment loads	Transport of inorganic materials such as suspended or bed load is considered relevant only in flowing systems. Therefore, it is not considered for this evaluation.	NA
Water quality	Water quality nutrient standards and open water	Yes
Navigation	Navigation of large watercraft not possible. The primary navigation on Lake Prevatt is by recreational boaters. This WRV is addressed under WRV 1.	NA

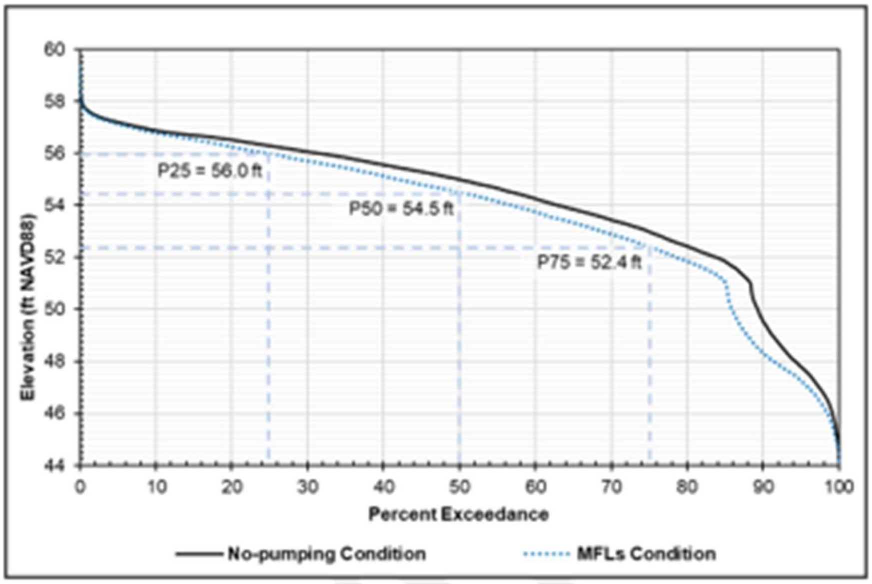

Figure 26. MFLs condition exceedance curve (blue, dotted) based on most constraining environmental metric as compared to the no-pumping condition exceedance curve (black, solid). Dashed lines indicate the recommended minimum P25, P50, and P75 elevations for Lake Prevatt, Orange County, Florida.

Table 15. Currently adopted and recommended Minimum Levels for Lake Prevatt, Orange County, Florida.

Original (adopted)			Recommended	
Level	Level (ft NAVD88)	Hydroperiod Category	Percentile	Recommended minimum lake level (ft NAVD88)
Minimum Frequent High	55.0	Seasonally Flooded	25	56.0
Minimum Average	52.0	Typically Saturated	50	54.5
Minimum Frequent Low	49.9	Semipermanently Flooded	75	52.4

APPENDIX D – MFLS STATUS ASSESSMENT

Section	Page	Comment
Current Status Assessment	1	Consider adding a statement that the event based metric or ecological criteria evaluated for the FH, MA, and FL were not the most limiting criteria. As such, the FH, MA, and FL discussed are not the recommended minimum levels.
Frequent High (FH)	2	Figure D-1: Consider revising the figure heading to say Frequent High Level and not "Minimum" Frequent High Level for consistency. At the bottom of the figure should it just say 30-Day Continuous Exceedance?
Minimum Average (MA)	4	Figure D-2: Horizontal red line should say Minimum Average not "Minimum Frequent Low"
Minimum Average (MA)	4	Figure D-2: The Minimum Average is assessed with Mean Non-Exceedance in Appendix C. Should this be the Annual Mean Non-Exceedance Probability? Should the note at the bottom say 180-Day Mean Non-Exceedance? Re-assess freeboard as appropriate.
Frequent Low (FL)	5	Table D-1: Do you want to call this the MFLs condition when these are not the recommended MFLs
Frequent Low (FL)	5	Table D-1: I recommend adding the frequency of the No-Pumping condition to this table to be fully transparent.
Frequent Low (FL)	6	Figure D-3: Consider revising the figure heading to say Frequent Low Level and not "Maximum or Minimum" Frequent Low Level for consistency.
Fish and Wildlife Metrics – Hydroperiod Tool	7	Average habitat area is likely not the most important comparison - depending on the metric and distribution of habitat vs. stage. If the habitat metrics are revised to compare average area for some and habitat change at specific elevations for other metrics, revise text and tables as appropriate.
Event Based Metrics	9	Table D-3: The MA and FL criteria allow about a 50% increase in the frequency of low water events. Are the best metrics evaluated? Does the SWIDS analysis with mean – or + SE result in an appropriate RI?
Fish and Wildlife Metrics – hydroperiod Tool	9	Replace "as compared to" with "with" --> Freeboard and deficit are also derived from the analysis of hydroperiod tool metrics, comparing the average area reductions under the MFL condition as compared to the no-pumping condition.

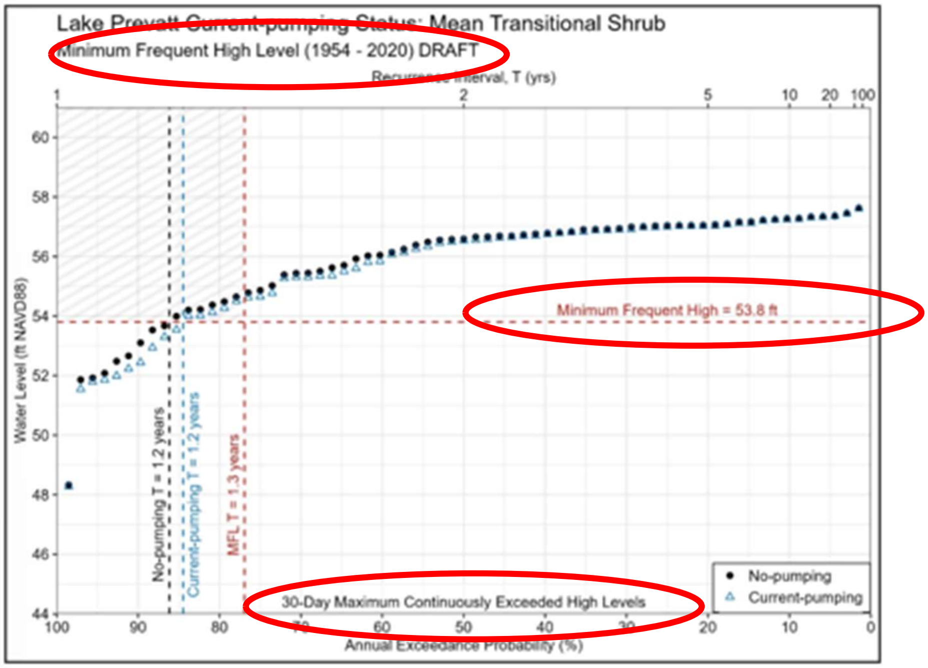

Figure D-1. Frequency analysis plot (i.e., Weibull plot) for the Lake Prevatt FH. Shown are the annual exceedance probability (bottom axis) and return interval (top axis) of the FH for the current-pumping condition (blue triangles) and no-pumping condition (black dots) versus the MFLs condition (red vertical and horizontal lines). The horizontal and vertical red lines represent the minimum magnitude (lake level) and return interval, respectively. The blue vertical line represents the current-pumping condition frequency and return interval. The black vertical line represents the no-pumping condition frequency and return interval.

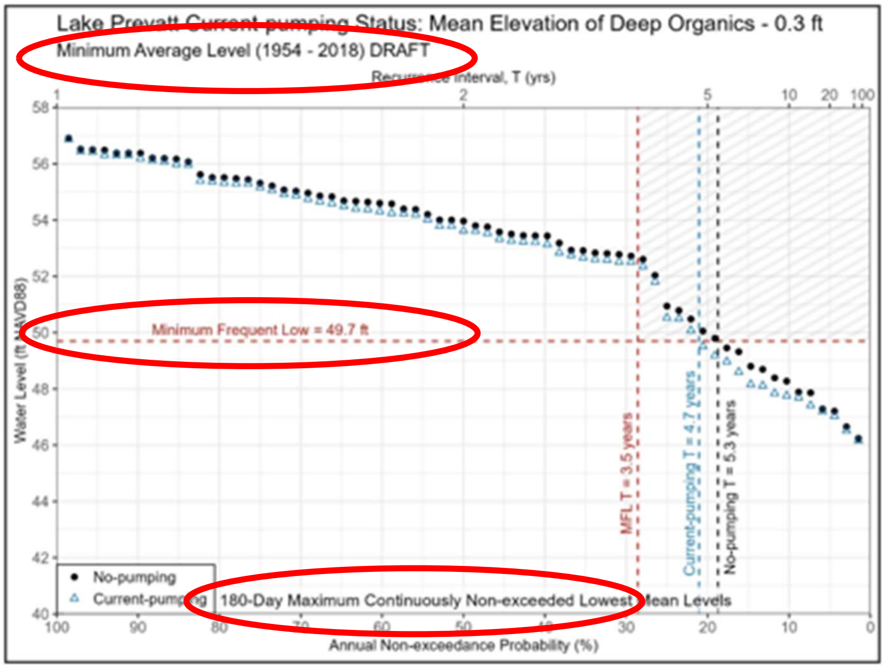

Figure D-2. Frequency analysis plot (i.e., Weibull plot) for the Lake Prevatt MA. Shown are the annual non-exceedance probability (bottom axis) and return interval (top axis) of the MA for current-pumping condition (blue triangles) and no-pumping condition (black dots) versus MFLs condition (red vertical and horizontal lines). The horizontal and vertical red lines represent the minimum magnitude (lake level) and return interval, respectively. The blue vertical line represents the current-pumping condition frequency and return interval. The black vertical line represents the no-pumping condition frequency and return interval.

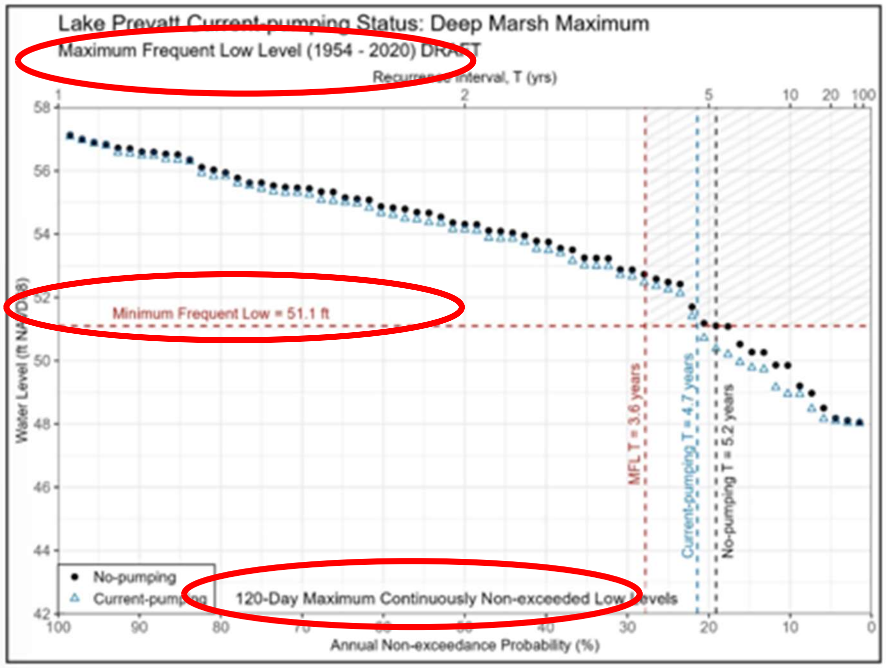

Figure D-3. Frequency analysis plot (i.e., Weibull plot) for the Lake Prevatt FL. Non-exceedance probability (bottom axis) and return interval (top axis) of the FL for current-pumping condition (blue triangles) and no-pumping condition (black dots) versus MFLs condition (red vertical and horizontal lines). The horizontal and vertical red lines represent the minimum magnitude (lake level) and return interval, respectively. The blue vertical line represents the current-pumping condition frequency and return interval. The black vertical line represents the no-pumping condition frequency and return interval.

APPENDIX E – WATER RESOURCE VALUES (WRVS) ASSESSMENT

Section	Page	Comment
Group 1 (WRVs 3, 8, and 10)	3	Peer reviewers concur that these WRVs are not applicable to Lake Prevatt.
Group 2 (WRVs 2, 4, 5 and 7)	4	Consider breaking WRV2 (Fish and Wildlife Habitat) and WRV1 (Recreation in and on the water) into their own category and assess with them using area comparisons at specific elevations rather than average area.
Group 2 (WRVs 2, 4, 5 and 7)	4-5	Peer Reviewers concur that WRVs 4, 5, and 7 are protected with the proposed MFLs. Additional analysis is recommended for WRV2
Group 3 (WRVs 1, 6 and 9)	5-10	Peer Reviewers concur that WRVs 6 and 9 are protected with the proposed MFLs. Additional analysis is recommended for WRV1

APPENDIX F – TOPOBATHYMETRIC DEM DEVELOPMENT FOR MFLS MODELING FOR LAKE PREVATT, ORANGE COUNTY, FLORIDA

Section	Page	Comment
All	All	The Topobathymetric DEM is well developed and has been corrected for different vegetative communities with ground truthed data. Peer reviewers find no deficiencies in the Topobathymetric DEM Development.

ATTACHMENT C

LAKE PREVATT SJRWMD RESPONSE TO INITIAL COMMENTS

SJRWMD Initial Responses to Peer Review and Stakeholder Comments Regarding Draft MFLs for Lake Prevatt, Orange County, Florida

5/15/2025

Introduction

Independent scientific peer review was conducted for the draft Lake Prevatt MFLs Report by Dr. Phil Burkhalter, a Senior Water Resources Engineer with Trihydro and Travis Richardson, president and owner of T. Richardson Soils and Environmental. Peer review comments on environmental criteria, minimum levels, and hydrological data analyses were based on review of the following documents:

Shadik, C. R., E. Revuelta, A. B. Sutherland, A. Karama, H. N. Capps Herron, and S. Fox. 2025. Minimum Levels Reevaluation for Lake Prevatt, Orange County, Florida. Draft Report. Bureau of Water Supply Planning, SJRWMD.

Appendix B: Hydrological Analyses;

Appendix C: Environmental Methods, Data, and Metrics;

Appendix D: MFLs Status Assessment;

Appendix E: Water Resource Values (WRVs) Assessment; and

Appendix F: Topobathymetric DEM Development

This preliminary resolution document provides SJRWMD responses to comments of larger concern submitted by the peer reviewers on April 10, 2025 in the initial findings teleconference presentation. In addition to comments submitted by the peer reviewers, several comments were also submitted by members of the general public. Some are addressed in this document as well. All peer review and stakeholder comments will be addressed in the final resolution document.

Peer Reviewer Comments / Recommendations:

Slide 12 of peer reviewers' initial findings presentation (T. Richardson)

In reference to page 16, Lake Level Datasets for MFL Analysis section of Appendix B: Hydrological Analysis

Figures B-12 and B-13: Because of the drastic visual difference in the pre/post +/- 1980 stage it seems that an analysis of rainfall plotted with lake levels should be presented either here or in the MFLs status assessment. (e.g., 2 yr, 3yr, 4yr moving average of annual rainfall plotted with lake levels, cumulative rainfall assessment, double mass, water budget to show that rainfall and PET are dominant factors over downward leakance, or other appropriate analysis). This is a concern of the peer reviewers and was a public comment.

SJRWMD Response:

Responses to address comments regarding trends pre/post 1980s in Lake Prevatt water levels are based on data from the south lobe (Figure B-13). This ensures the full range of lake fluctuation is considered. Visual differences in water levels pre- and post- 1980 can be attributed to a combination of multiple factors.

The first factor that seems to be contributing to a pre/post 1980 shift in Lake Prevatt hydrology is the overall decrease in rainfall. As requested by the peer reviewers, Figure 1 displays moving averages of rainfall, from the Isle-Win station and NEXRAD combined record (Sarker et al. 2024), at various time scales with no-pumping and current-pumping Lake Prevatt water levels. While no full-record trends are visible, shorter-length trends do seem to be present. Most notable are the shorter length (6-month) peaks and troughs in rainfall preceding high or low water levels. Throughout the record, decreasing wet season rainfall for multiple years (3-5 years) precede dry events, and wet events seem to be preceded by relatively wetter dry seasons or immediate wet events (storm events; Figure 1). The longer-term trends (1-year and above) are more difficult to visualize due to the small scale of average daily rainfall.

To determine relative drought or wet events on longer time scales, the Standard Precipitation Index (SPI) can be used. SPI is a widely used index for drought assessment based on accumulated rainfall for a given period compared with the long-term average of the same period (McKee et al. 1993). The SPI allows for the evaluation of localized drought by using locally-derived rainfall data rather than larger scale climatic indices.

The SPI values compared with Lake Prevatt water levels in Figure 2 display relative drought conditions in red and wet conditions in blue on a 5-year (60-month) scale. The 5-year scale for SPI was chosen as it is generally a good representation of relative wet/dry periods within the 3 to 7 year El Niño Southern Oscillation (ENSO) climate cycle (Kuss et al. 2014; Kirtman et al 2017). When comparing normalized, accumulated rainfall around Lake Prevatt with lake water levels, more pronounced rainfall trends become apparent. Lower, more pronounced, dry season lake level drawdowns began in the late 1970s and early 1980s with the presence of higher intensity and longer lasting droughts. Between the early 1990s and early 2000s, more prolonged periods of lake level drawdown occurred with the longest and most intense drought periods within the period of record. Equivalent increases in lake level with wet periods did not occur because the lake outflow elevation of 55.6 NAVD88 does not allow for long-term storage above that elevation.

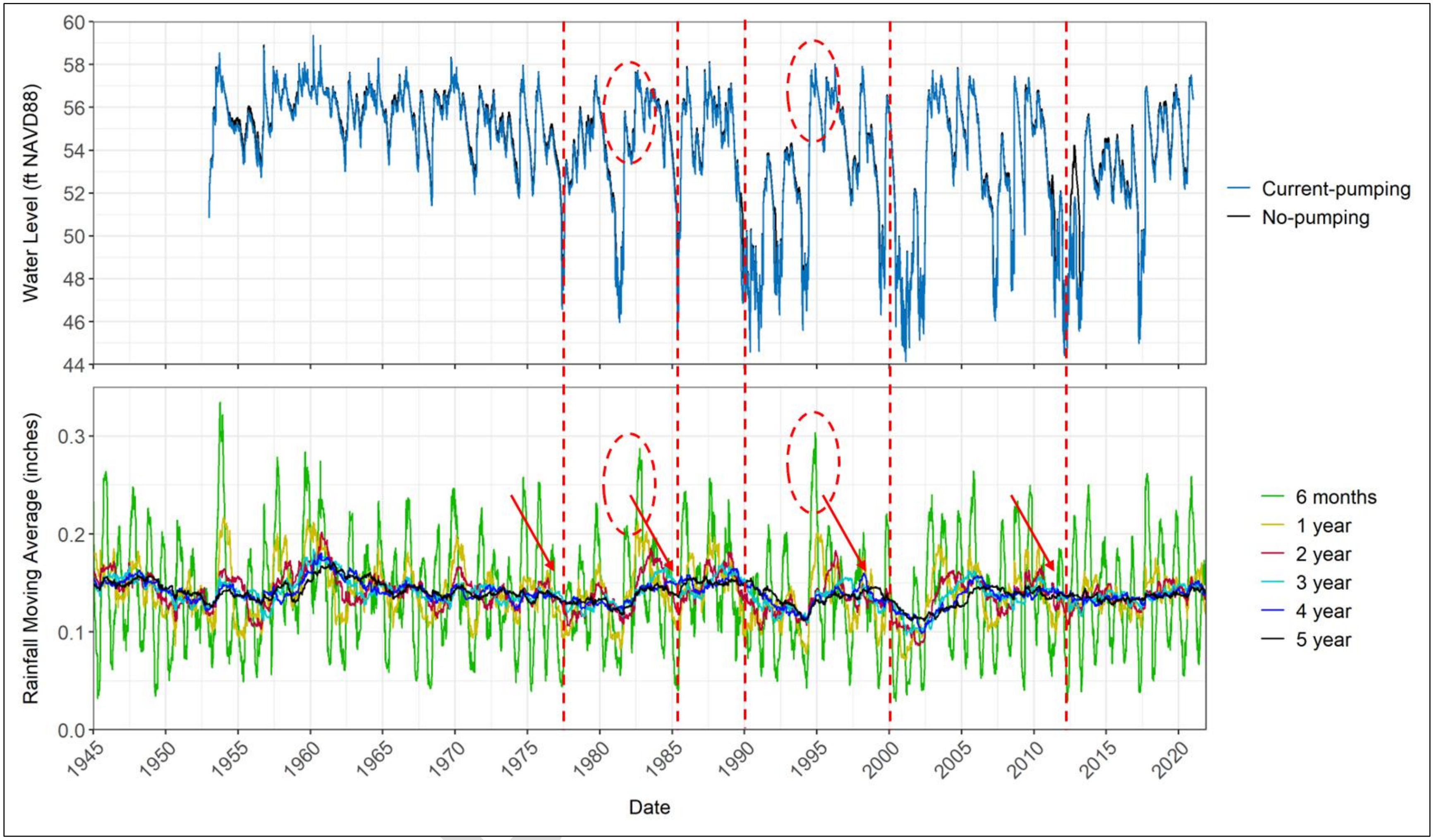

Figure 1: Lake Prevatt current-pumping and no-pumping condition lake level stages (top panel) with moving averages of daily rainfall compiled from the Isle-win station (pre-1995) and NEXRAD data (post-1995) used in the development of the Lake Prevatt surface water model (bottom panel; Sarker et al. 2024). Ovals show examples of immediate water level response to large rainfall events, dotted lines designate dry event examples, and arrows designated decreasing wet season rainfall preceding dotted line events.

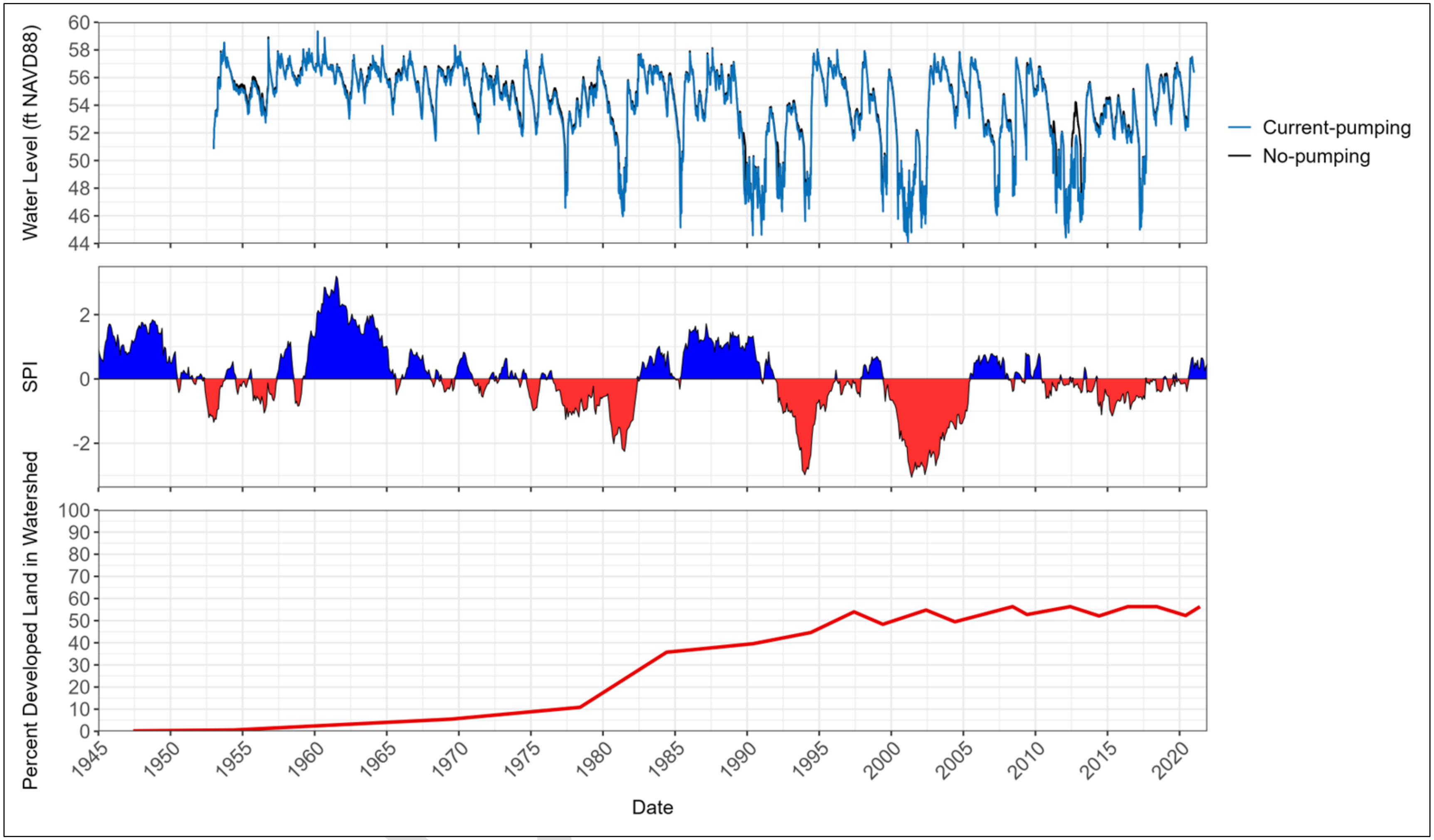

Figure 2: Lake Prevatt current-pumping and no-pumping condition lake level stages (top panel) with 5-year SPI (middle panel), and percent developed land within the watershed (bottom panel). SPI was calculated from the Isle-win station (pre-1995) and NEXRAD rainfall data (post-1995) used in the development of the Lake Prevatt surface water model (Sarker et al. 2024). Percent developed land within the watershed was compiled from digitized historical aerial imagery and FLUCCS data. Oscillations between 1997-2022 are a result of FLUCCS data classifying stormwater ponds as water vs digitized aerial imagery including stormwater ponds in developed area.

The influence of SPI on water levels (pre- and post- 1980) was statistically analyzed using a Generalized Linear Model (GLM) with pre- or post-1980 as a factor. Figure 3 displays the trend between SPI with Lake Prevatt historical water levels pre- and post-1980. Historical levels were used in this analysis to incorporate any changes in pumping that would have occurred through time. If there were no significant difference between SPI pre- and post-1980 and a significant difference in the slope of SPI influence pre- and post-1980, this would suggest that variables other than climate (e.g., pumping or land use change) might explain water level trends. The results of the GLM suggest a significant relationship between pre-1980 5-year SPI and water levels ($p < 0.05$; Table 1). The post-1980 water levels are statistically different than pre-1980; the trendline of the post-1980 relationship has an intercept 1.98 ft lower than pre-1980 levels. There was no significant difference in the slopes of the pre- and post-1980 lines (parallel lines, $p > 0.05$) suggesting that there was the same significant influence of SPI throughout the period of record. Shifting SPI (drought/rainfall) directly influenced water levels. The distribution of the SPI values pre- and post- 1980 can be further visualized in Figure 4.

These analyses suggest that climate (rainfall surplus vs deficit) are, at least in part, related to the pre/post-1980 shift in water levels at Lake Prevatt. Cumulative years of below-average rainfall are much more prevalent after the late 1970s/early 1980s (Figure 2). This drying of the landscape contributes to both declines in surface water inflows and reduced recharge to groundwater, which can partially explain the difference in mean water levels and fluctuation pre- vs post-1980.

Table 1: Output from the Generalized Linear Model (GLM) of the 5-year SPI and Lake Prevatt water levels with a factor level of pre- and post- 1980.

Effect	Estimate	Std. Error	t-value	p-value	Interpretation
Intercept	55.29	0.15	379.56	$< 2e^{-16}$	The y-intercept of the pre-1980 trend is significant
5-year SPI	0.69	0.14	4.89	$1.35e^{-6}$	SPI pre-1980 is significantly and positively related to water levels with a slope of 0.69
Post-1980	-1.98	0.19	-10.58	$< 2e^{-16}$	The post-1980 y-intercept is significant and is 1.98 ft lower than the pre-1980 trendline
5-year SPI : Post-1980	0.11	0.18	0.65	0.519	The relationship of post-1980 5-year SPI and water levels has a slope 0.11 greater than the pre-1980 relationship, but it is **not** significantly different than the pre-1980 relationship.

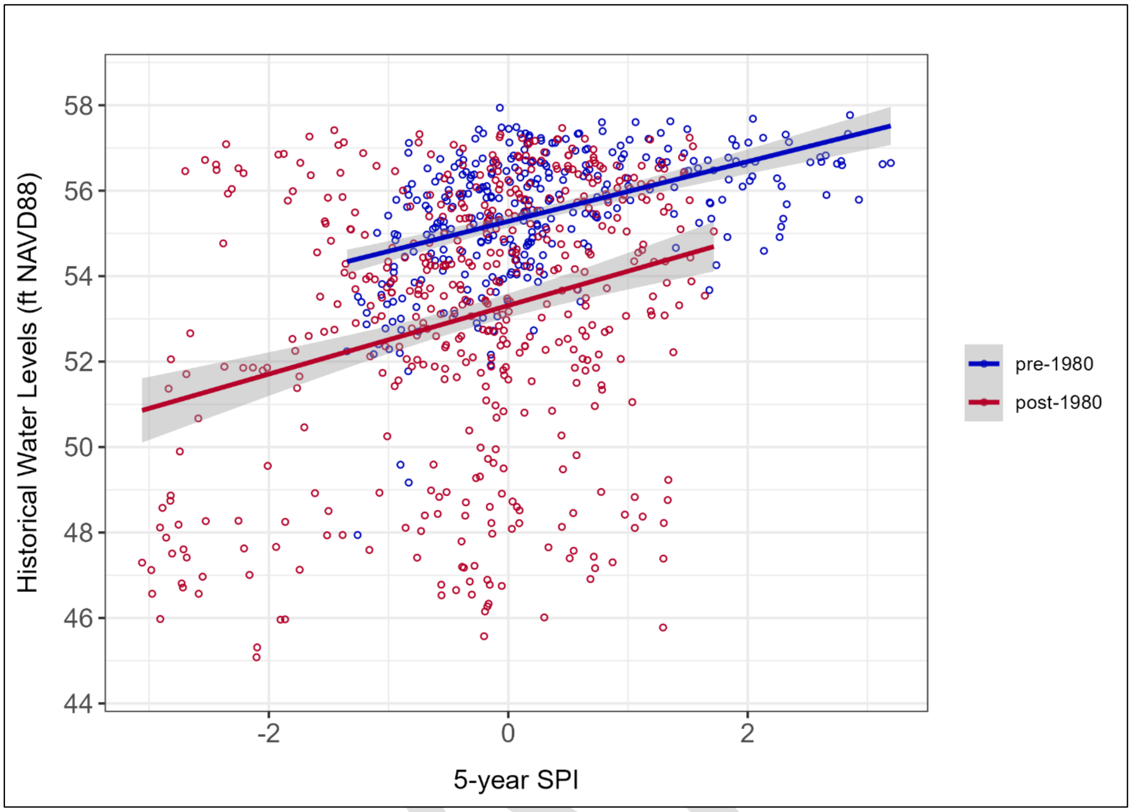

Figure 3: Lake Prevatt historical condition lake level stages in response to the 5-year SPI in the pre-1980 (blue dots) and post-1980 (red dots) record. Linear regression lines are displayed for both data sets in their respective colors. The 95% confidence intervals are displayed in gray around each line.

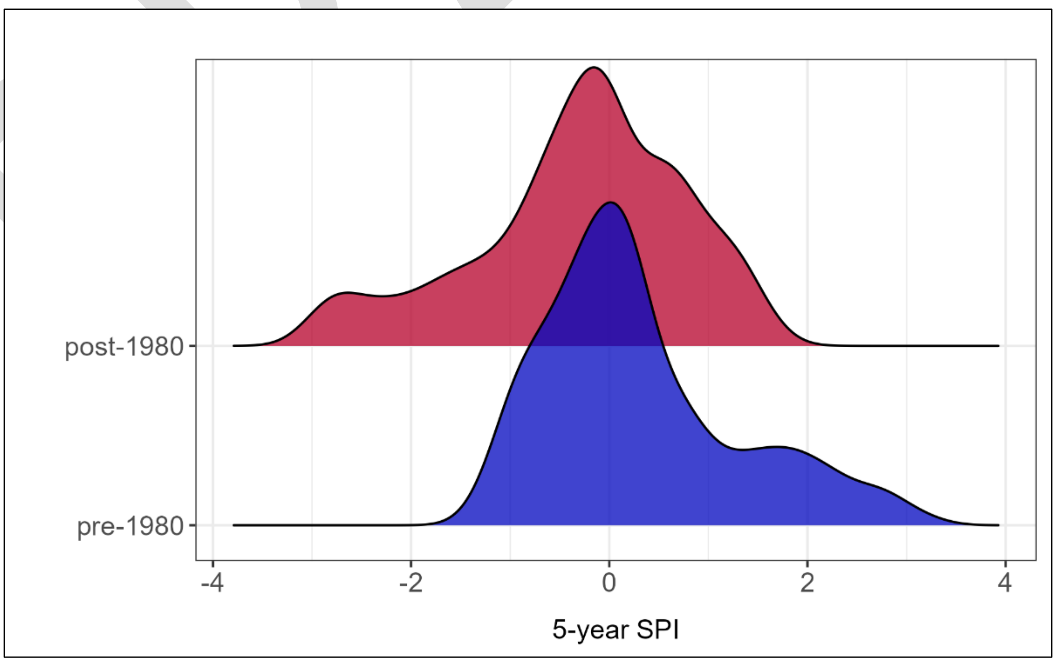

Figure 4: Density plots of pre-1980 SPI values (blue) and post-1980 SPI values (red) influencing Lake Prevatt water levels. Note the presence of major drought values and absence of major wet values post-1980 as compared to pre-1980.

Factors other than climate and pumping are known to alter surface water hydrology. Shifts in land use/land cover and increases in impervious surface % are known to change storage and runoff dynamics and thereby alter average water levels and water level fluctuation in lakes (van der Kamp et al. 2008; Engel et al. 2015; McGrane 2016). The potential role of land cover change in the pre/post-1980 water level shift at Lake Prevatt was evaluated.

Percent developed land within the Lake Prevatt watershed was analyzed using available historical areal imagery from UF and FDOT and available Florida Land Use Land Classification Code System (FLUCCS) data. The area of developed land within the watershed increased from 10.8% in 1978 to 35.7% in 1984 (Figure 5). Modern levels of developed land within the watershed were reached by 2008 (56.3%). The result of this rapidly urbanizing landscape is an increase in percent impervious surface cover and changes in the way water reaches (or does not reach) Lake Prevatt. With the installation of stormwater systems, water is held in stormwater ponds until enough rainfall allows for the release of water over control structures. This could result in reduced overall baseflow from smaller rainfall events, and larger spikes in flow (quicker water level rise) after storm events. This transition from a more stable to a flashier system, due to increased urbanization and impervious surface %, is well documented in flowing systems (Hollis 1975; Dunne and Leopold 1978; Paul and Meyer 2001; Gordon et al. 2004; Ganon et al. 2022). In areas where the amount of impervious surface within a catchment increases from 10 to 20%, runoff increases twofold; an increase from 30 to 50% increases runoff threefold (Arnold and Gibbons 1996; Paul and Meyer 2001). The reduction in baseflow, common in urbanized watersheds (Klein 1979), could be reducing the regular influx of water to Lake Prevatt outside of storm events, exacerbating drought conditions.

The water budget for Lake Prevatt was analyzed as part of the HSPF modeling process (Sarker et al. 2024). Groundwater loss to the UFA makes up the majority of lake water loss. Leakance parameters for the South Lobe change from 0.002 when water levels are above 51 ft (elevation of lobe connection) to 0.025 when water levels are below 51 ft. As is seen in other moderately connected lakes, leakance at Lake Prevatt is higher at lower stage elevations. This characteristic of the lake is accounted for in the surface water model.

The elevation of lobe connection (51 ft NAVD88) is also important for water flow between the two lobes of Lake Prevatt. When lake levels are above 51 ft NAVD88, water flows from the north lobe into the south lobe. Therefore, during wet periods, the drainage basin of the south lobe is composed of both yellow polygons shown in Figure 5. During dry periods, the effective drainage basin of the south lobe is reduced from the entire watershed to the southeast subwatershed of Figure 5. The pronounced increase in lake level fluctuation can therefore be partially attributed to the interaction of long-term rainfall with basin morphology. The trend of larger lake level fluctuations in the lower-lying south lobe of Prevatt during dry phases has also been observed in lakes cut off from the flow of other nearby lakes. In areas where drought changes the effective watershed area of a lake (from flow disconnection), water declines faster because water loss in the lake becomes larger than can be supported by the inflow of a smaller watershed area (van der Kamp et al. 2008).

SJRWMD staff understand that there is a concern from peer reviewers and stakeholders regarding the post-1980 lower water levels at Lake Prevatt especially given the small average difference between the NP and CP conditions. It should be noted, however, that the seemingly small difference between the NP and CP conditions, described in previous public meetings and the Lake Prevatt draft report, is only relative to the average. Larger differences between the two conditions do exist but only during periods of large UFA drawdown. Figure 6 gives an example of one such event where there is a 5.5 ft difference in the NP and CP conditions in the lake. While the impact value remains the same between the NP and CP UFA conditions, the effect of this drawdown becomes more pronounced in the lake at UFA elevations below about 39 ft NAVD88 and when leakance values (previously described) are higher with lake stages < 51 ft NAVD88. Multiple large drawdown events occur throughout the period of record, but on average, the difference between NP and CP conditions is small.

It is understandable that the pre/post-1980 shift in the Lake Prevatt hydrograph would cause concern about the potential impact of groundwater withdrawal on this lake. However, it is important to note the considerable work that goes into determining the relative contribution of pumping versus climate (and other factors) on MFLs systems. The ECFTX v. 2.0 groundwater model used for the Lake Prevatt impact assessment is extremely complex, bringing together numerous types of data (e.g., hydrological, hydrogeological, meteorological, landcover, soils, bathymetry, water use, etc) over large spatial and temporal scales. The ECFTX is based on best available data and extensive effort from multiple agencies. The Central Florida Water Initiative (CFWI) required the input of agencies including South Florida Water Management District (SFWMD), SJRWMD, Southwest Florida Water Management District (SWFWMD), Florida Department of Agriculture and Consumer Services (FDACS), Florida Department of Environmental Protection (FDEP), public supply utilities, and other interested parties and stakeholders in the creation of the ECFTX model. Eight separate working groups, to oversee various aspects of the groundwater model, were created to ensure collaboration employed expertise where needed. Version 2.0 of the ECFTX model was recalibrated specifically for the Wekiva River springs contributing basin and Seminole County. Therefore, the District feels confident that the impact analysis developed for this system using the ECFTX v. 2.0 represents our best understanding of the role of pumping on Lake Prevatt.

The analyses described above strongly suggest that the pre/post-1980 shift in stage fluctuations at Lake Prevatt are a result of climatic influence and watershed development. It is important to note that the NP condition is not meant to represent a system with no anthropogenic influence, only no-pumping influence. It is very likely that human-induced changes in watershed imperviousness, storage, and runoff have altered the hydrology at Lake Prevatt. When combined with the dramatic increase in deficit rainfall (post vs pre-1980; Figure 2), it is reasonable to conclude that these changes have contributed to the observed water levels at Lake Prevatt. It is also important to note that MFLs are not meant to restore systems to a pre-anthropogenic condition but prevent significant harm due to groundwater pumping. Other alterations due to anthropogenic, climatic, or other changes are possible, but cannot be addressed by the MFL.

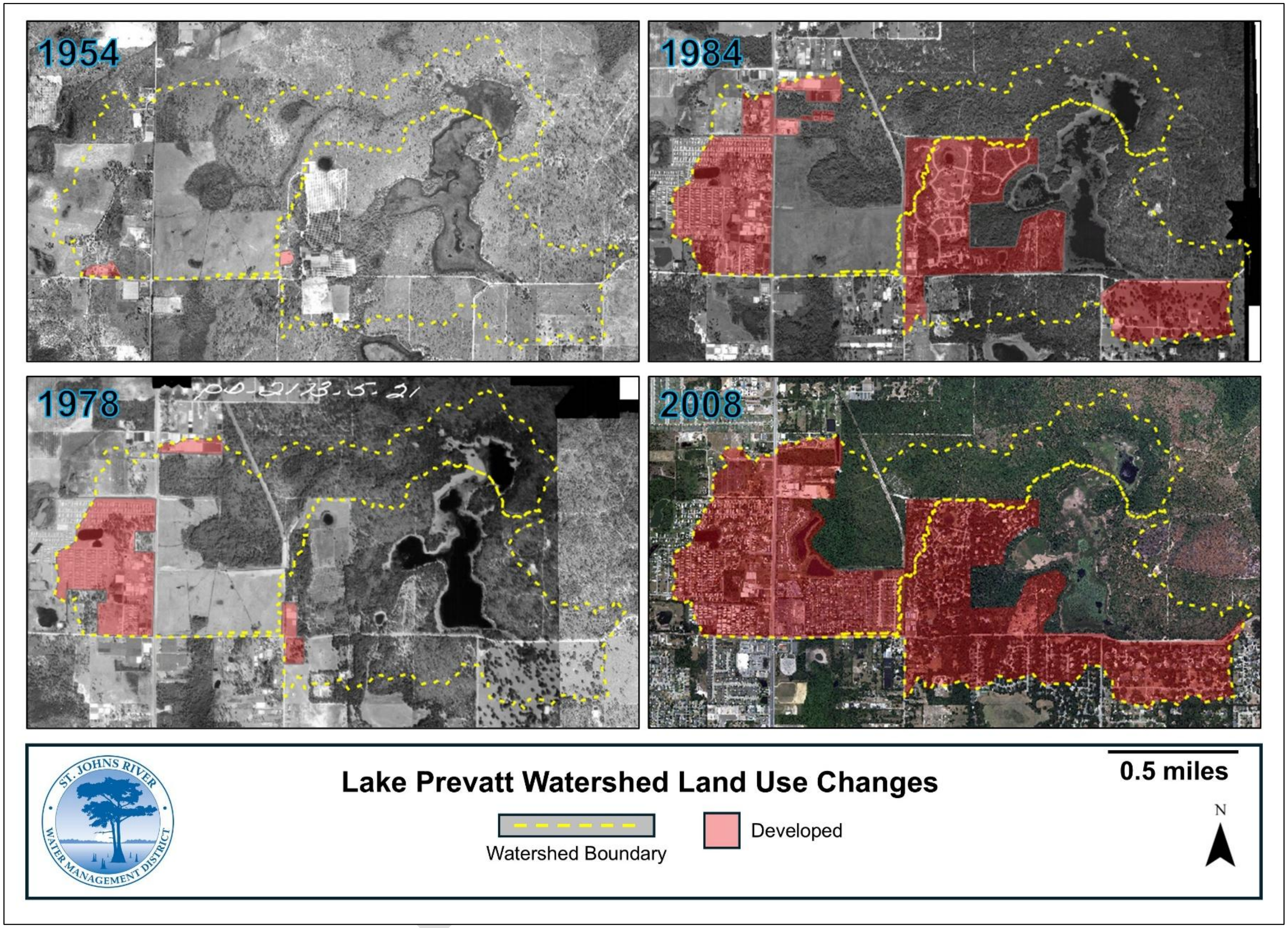

Figure 5: Developed (red shaded, mostly impervious) area within the Lake Prevatt watershed at 1954, 1978, 1984, and 2008.

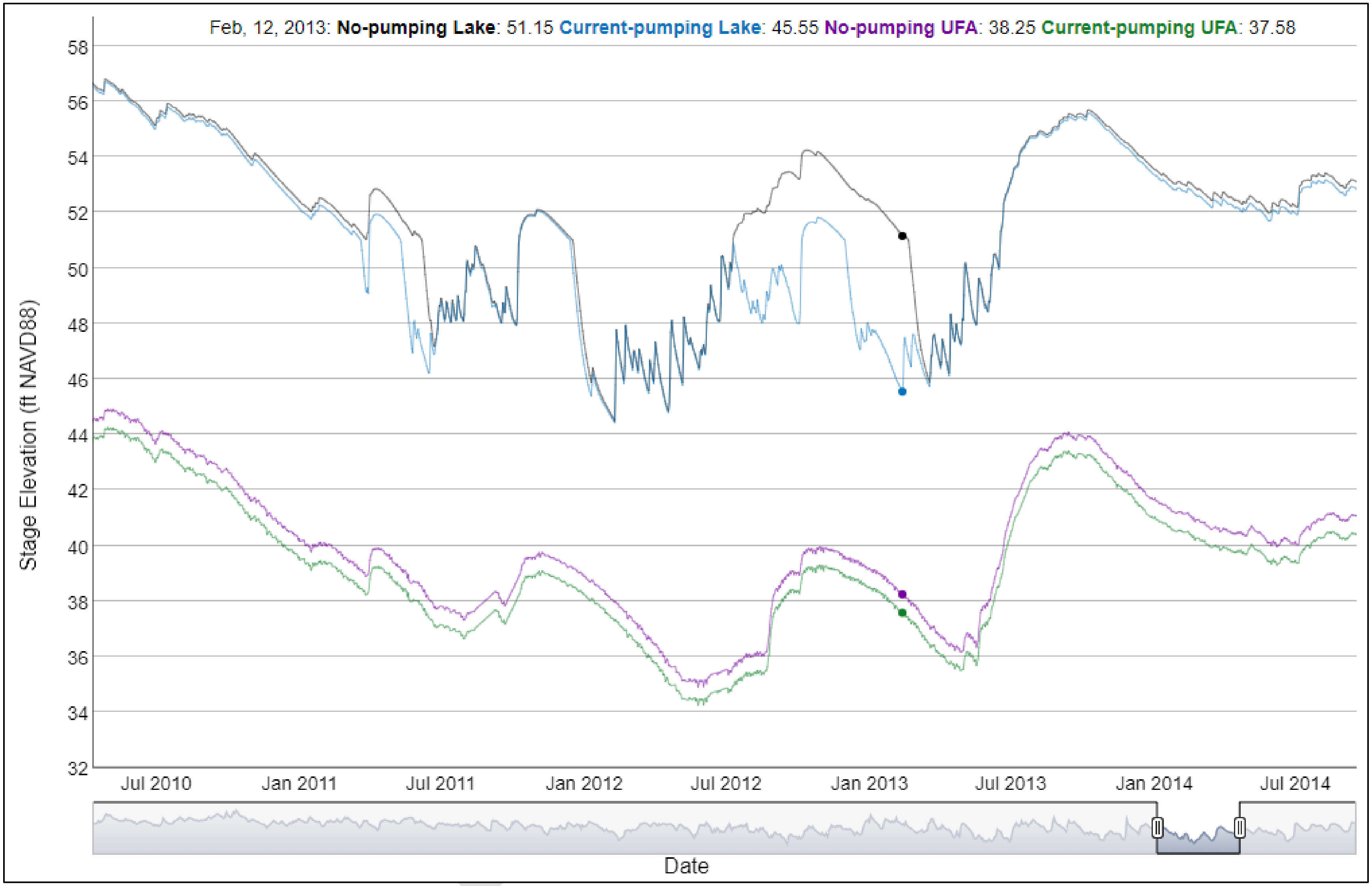

Figure 6: Lake Prevatt lake NP (black) and CP (blue) conditions with UFA NP (purple) and CP (green) conditions from July 2010 through July 2014. Stage elevations for February 12, 2013 (within a drought period) are shown at the top of the panel.

Slide 14 of peer reviewers' initial findings presentation (T. Richardson)

In reference to page 13-64, Transect Data section of Appendix C: Environmental Methods, Data, and Metrics

General Notes for future comments/discussion: comparisons using same datum: Min elevation of Mesic Hammock (current data 0.2, 2.2, 0.6 higher than 1997); Max shrub swamp (current data 1.5', 1.6', 1.9' lower than 1997 data); 0.5" muck (current data 1.25' and 1' lower than 1997 and T3 is 0.2' higher than 1997), Note for future discussion - CFWI wetland boundary (57.24, 58.12, 57.34) – 62-340 FAC wetland boundary is within Mesic Hammock on two transects; CFWI - half inch muck (54.5, 54.54, 54.53)

SJRWMD Response:

As previously described, many changes occurred in the Lake Prevatt watershed in the 25 years between the original and current MFLs data collection. Any changes in environmental data may be due to climatic or anthropogenic changes that have occurred within the past 25 years. In addition to the time elapsed, comparison of the 1997 MFL data with current MFL transects is obscure due to the way vegetation data were collected in the original MFL. The designation of original communities was not linked to vegetation abundance in the way current data are. Therefore, the comparison of communities here is a best approximation of which communities would be comparable from the 1997 report to present.

<u>Comparison of the minimum elevation of the Mesic Hammock communities (Live Oak Hammock in 1997 to current Mesic Hammock)</u>

The minimum elevations of the present Mesic Hammock community do appear higher than they were in 1997. The most comparable modern transect to the 1997 data would be T2, as it was placed in a similar area to the 1997 transect on the south side of the lake. Hupalo (1997) did not designate which plant species, besides live oak, are present in the Mesic Hammock. From wetland plant codes and previous knowledge of the area, these species are assumed to be at least live oak, shiny blueberry, saw palmetto, American holly, and inkberry. Vegetation in the Mesic Hammock of T2 is similar to that of the 1997 MFLs transect and can likely be compared. It should be noted that exact locations of transects from early MFLs cannot be directly replicated (generally working from drawings); therefore, transect locations may be close, but not exact and suggests the necessity for a reevaluation.

One possible explanation, for the lower minimum elevation of the Mesic Hammock community in 1997, is that the transects were likely in slightly different locations and therefore likely started at different elevations. The minimum elevation of the Mesic Hammock on T2 established in 2022 was 58.2 ft NAVD88 whereas the maximum elevation of the 1997 Live Oak Hammock was 57.2 ft NAVD88. This suggests that the current T2 Mesic Hammock Community began higher in the landscape.

When comparing minimum elevations of these communities, the modern MFL has an additional Transition Zone directly below the Mesic Hammock not defined in 1997. This could be due to the actual absence of a Transition Zone or a difference in the way previous staff collected vegetation data from current staff (lumpers vs splitters). The vegetation in the Transition Zone of 2022 is more comparable to the 1997 Live Oak Hammock than the Shoreline community (described as having wax myrtle, Baccharis, and inkberry).

Without direct specification of which species were included in the 1997 Live Oak Hammock community, it is unknown whether the 1997 Live Oak Hammock would be directly comparable to the Mesic Hammock or a combination of upper communities together from either 1997 or 2022. Table 2 below compares these elevations.

Table 2: Comparison of Live Oak Hammock (Hupalo 1997) and 2022 Mesic Hammock and Transition Zone elevations.

Elevation (ft NAVD88)	1997 Live Oak Hammock	1997 Live Oak Hammock + Shoreline	2022 Mesic Hammock	2022 Mesic Hammock + Transition Zone
Minimum	56.0	55.0	58.2	54.3
Maximum	57.2	57.2	*60.5	*60.5
Mean	56.6	56.0	*59.0	*57.2
Median	56.6	56.0	*58.8	*57.1

*Provided for comparison purposes only. Based on first measured elevation of transect to end of vegetation community. True maximum, mean, and median values cannot be provided (and are not in the main report) because true maximum, mean, and median values cannot be determined when upper elevations of the community are controlled by access road maintenance.

If comparing only Live Oak Hammock to Mesic Hammock, the minimum elevation of the 1997 Live Oak Hammock (56.0 ft NAVD) is lower than the current Mesic Hammock community (58.2 ft NAVD88), a difference of 2.2 ft. This difference in elevation may not be of great concern as the 1997 data collection occurred after a period of relatively longer-term drought (see Figure 2 above, 5-year SPI). The Live Oak Hammock could have been lower for a time, and higher elevations in the current vegetation of the Mesic Hammock could be a reflection of relatively wetter conditions in years preceding vegetation data collection, excluding dryer species from moving downslope.

This trend is also obscured by regular controlled burns of the higher elevation communities. Fire scars are evident in the Mesic Hammock community, and recent signs of fire were evident as of the peer review site visit in February of 2025. Higher modern Mesic Hammock elevations could be a result of fire limiting the growth of drier, newly recruited vegetation downslope.

Overall, the lower boundary of the Mesic Hammock may be dependent upon 1) the species included in the community designation, 2) whether a Transition Zone was delineated, 3) the influence of land management practices, and/or antecedent climate conditions. Antecedent conditions (i.e., being within a dry or wet cycle) prior to data collection may greatly influence these transitional elevations. Additionally, the Mesic Hammock moving upslope suggests that drier vegetation is not encroaching into lower communities; any further trends in higher community elevations would have to be addressed over a greater number of sampling events.

Comparison of the maximum elevation of the Shrub Swamp communities

The Transitional Shrub and Shrub Swamp communities collected in 2022 were designated by buttonbush coverage. The Transitional Shrub community was a transition to increased coverage of buttonbush (cover class of 3) and the Shrub Swamp community was designated with a buttonbush cover class of 4. The Shallow Marsh Community collected in 2022 also had buttonbush with a cover class of 3 but was mixed with many other shallow marsh species.

From vegetation descriptions in Hupalo (1997), the Shrub Marsh community contained buttonbush, smartweed, warty panicum, maidencane, and foxtail. Comparing available vegetation information, it seems that the Shrub Marsh community of 1997 should be compared to the Transitional Shrub, Shrub Swamp, and Shallow Marsh communities of 2022, not just the Shrub Swamp. The current work designates a greater number and more detailed communities relative to the 1997 report. This additional resolution aids in SWIDS calculations and building SWIDS datasets. The comparison of these communities is presented in Table 3, below. These include elevations from 2022 collected at T2 for direct comparison of similar areas described in 1997.

Table 3: Comparison of Shrub Marsh (Hupalo 1997) and 2022 Transitional Shrub Swamp, Shrub Swamp, and Shallow Marsh communities.

Elevation (ft NAVD88)	1997 Shrub Marsh	2022 Shrub Swamp	2022 Transitional Shrub + Shrub Swamp + Shallow Marsh
Minimum	51.0	52.1	51.0
Maximum	55.0	53.4	54.3
Mean	52.9	52.8	52.5
Median	52.9	52.9	52.3

After considering the 2022 communities together for better comparison to the 1997 data, the maximum elevation of a community with buttonbush is only 0.7 ft (8.4 inches) lower in elevation in 2022 than in 1997. The difference of 8.4 inches on a steep slope, as is present on the south side of Lake Prevatt, is only about 10 - 15 ft laterally. Therefore, the change is not considered to be substantial as mean elevations of the 2022 Shrub Swamp are within 0.1 ft of the 1997 Shrub Marsh and the combined 2022 communities have a mean within a half foot of the 1997 Shrub Marsh. Additionally, the positions of these communities may not have changed, but may have lower elevations from 1997 if any soil subsidence occurred, as suggested by Dan Shmutz of GPI on April 10th, with prolonged droughts between 1997 and 2022 (See drought indices previously described). As described above, community and species elevations naturally shift over time due to climate. The differences noted over the 25 years between sampling efforts could be simply due to differing climate conditions antecedent to data collection.

Comparison of muck elevations

As with vegetation elevation comparisons, the comparison of muck depths between 1997 and 2022 are also not direct comparisons. The 2022/2023 relevant soils data collection at Lake Prevatt were recorded in terms of hydric soil indicators (A1, A2, A8; Table 4). The

1997 MFLs soils data were recorded as ≥ 0.1 ft or ≥ 1.0 ft of muck (Table 4). Despite the differences in depth of organic material, the mean elevations of 2022 A1 and A2 are slightly higher than the 1997 muck depths ≥ 1 ft. This could be because T1, on which the A1 and A2 elevations in 2022/2023 were based, did not reach the same lower elevations as the 1997 Transect or the 2022 T2 or T3. If staff were able to reach the lower elevations before water levels rising to document lower deep organics, the elevations may have been more similar. The 1997 data collection occurred when water levels were 47 ft NAVD88 (P97.5) so the entire lake bottom was exposed for sampling. The lower elevation of deep organics in 1997 was likely due to the ability to sample lower elevations.

Comparing maximum 2022/2023 A8 depths to 1997 muck presence and 2021 CFWI muck at surface, the 2022/2023 depths are about a foot lower in elevation. The location of muck at the surface is not as reliable as the location of deep organics. The amount of shade/direct sunlight, seepage, or organic input that allows for the maintenance of a thin muck layer could vary greatly through time and may not always be directly related to surface water hydrology. As landward muck signatures can be variable and more influenced by recent flood-drought cycles (Richardson et al. 2009), it is reasonable that the 1997 muck presence varies from the 2022/2023 data collection due to 25 years of climatic variation. As for the 2021 CFWI muck at surface elevation, SJRWMD MFLs staff do not consider this elevation to be appropriate for comparison as the CFWI DMIT transects were established on a seepage slope (eastern side of south lobe) purposefully avoided for a transect in the current MFL for this reason.

Table 4: Comparisons of muck elevations and deep organics from 1997, 2022/2023, and 2021 at Lake Prevatt.

Elevations (ft NAVD88)	1997 Muck Presence (≥ 0.1 ft)	1997 ≥ 1 ft muck	2022/2023 A1	2022/2023 A2	2022/2023 A8	2021 CFWI Muck at Surface
Minimum	47.9	47.9	48.9	48.9	48.9	
Maximum	54.6	49.9	50.8	51.3	53.5	54.5
Mean	49.0	48.6	49.8	50.0	51.0	
Median	49.0	48.4	49.9	50.0	50.7	

Overall, when comparing the 1997 MFL data to current MFL data, determining which communities to compare between sampling points much be determined by community composition, not community names. In the 25 years between sampling points, changes in rainfall, increased urbanization, and controlled burns all occurred within the area surrounding Lake Prevatt. SJRWMD staff would not expect the elevations of these communities to remain static due to changes in antecedent sampling conditions.

Slide 16 of peer reviewers' initial findings presentation (T. Richardson)

In reference to page 73, Transect Quadrat-level Cluster Approach – A Bottom-up Method for Vegetation and Community Frequencies and Return Interval sections of Appendix C: Environmental Methods, Data, and Metrics

"After RIs were calculated for each site included in the PCA cluster, the final site RI was calculated by taking the mean ± standard error of all observed RIs. A mean + standard error was used for exceedance metrics and the mean - standard error for non exceedance." Is this consistently applied in other MFLs? What about when the system is on the other side of the mean? Should the Median be used to minimize effects of "outliers"? Should a straight 15% reduction (for exceedance)/addition (non-exceedance) be applied to the frequency of the hydrologic signature for the no-pumping condition. See Habitat metrics for 15% threshold.

SJRWMD Response:

The application of mean +/- standard error is consistently applied in other MFLs. Due to the nature of calculating any statistic of central tendency, there will always be systems on either side of the mean or median value. The inclusion of systems on either side of the mean or median is a part of both present and past MFLs SWIDS methods; the difference in the current method is that outliers are filtered in a systematic and repeatable manner through the clustering method. Using the median would not change whether systems are on one side or another (i.e., there will always be systems on either side of the mean or median).

Using a 15% reduction from the NP RI is an option but may not be directly comparable to the way the 15% reduction is used with the HT metrics. The 15 % reduction with the HT metrics are generally an area or temporal reduction (without the duration and RI component). Using a 15% reduction from an NP RI would have to have a substantial ecological rationale over a value informed by data gathered from similar systems.

In reference to page 74, Average Habitat Area section of Appendix C: Environmental Methods, Data, and Metrics

The average habitat area may not be the most appropriate metric for determination of a 15% change in habitat. Consider adjusting to habitat area and stating that average habitat area is used for some metric while differences in area at specific stage elevations are used for other metrics to capture critical ecologic functions. For example, the 5 ft water depth is not really critical until water levels drop below 52 ft. What does the percent habitat change look like no-pumping vs. current condition in half ft increments: 52, 51.5, 51, ... (Note: since the evaluation is 5 ft depth you would evaluate change from 57, 56.5, 55…)

SJRWMD Response:

SJRWMD staff disagree that water depth is not critical until water levels drop below 52 ft. The goal of the HT percent area reduction is to account for the amount of available habitat area across all elevations present in the NP hydrograph. Critical habitat depth can occur at any elevation and should not be limited to only the lowest elevation at which it can occur. Limiting habitat area in this manner would not serve to protect the WRVs at an MFL lake. An example using the 5 ft open water depth HT metric is displayed in Figure 7. If limited to only elevations under 52 ft, very little critical depth habitat would be available, and the areas of critical depth at higher elevations would not be considered.

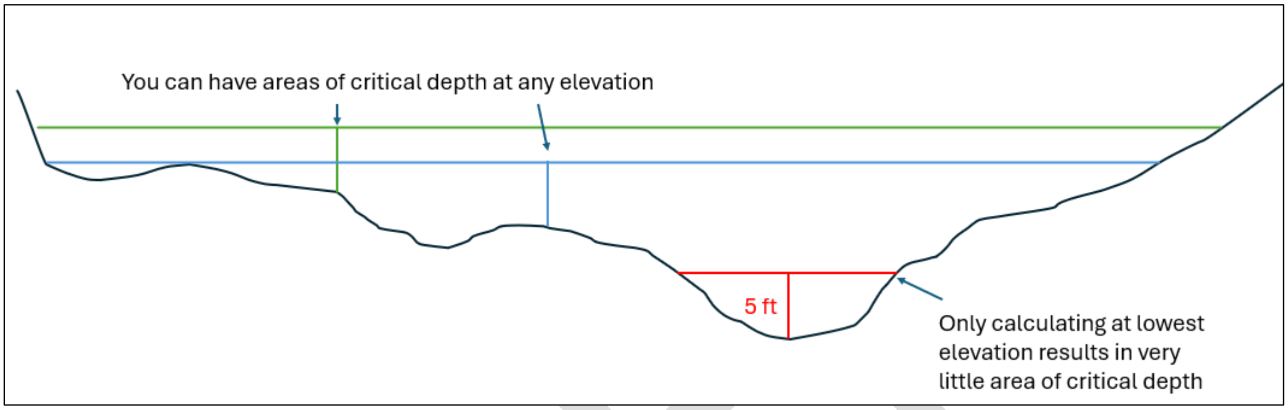

Figure 7: Conceptual drawing of the importance of upper water habitat areas in addition to lower water habitat areas.

If the comment was to be approached alternatively from a temporal exceedance perspective, only looking at a 15% reduction in time 52 ft is exceeded, there would need to be sufficient ecological rationale to do so. Again, constraining the percent reduction in time to this lowest condition excludes the importance in any loss or gain in the upper elevations. However, if we were to do this, a 15% temporal exceedance of 52 ft is 9% less constraining than the current MFLs condition.

Slide 17 of peer reviewers' initial findings presentation (T. Richardson)

In reference to Figure 25 of Appendix C: Environmental Methods, Data, and Metrics

I would assume that areas outside of the lakes fluctuation range are excluded from the area calculations?

SJRWMD Response:

Yes. The current figures will be updated in the final document to reflect the full range of elevations in the DEM as well as what is possible within the observed range of lake fluctuation.

Slide 19 of peer reviewers' initial findings presentation (T. Richardson)

In reference to page 77, Average Habitat Area section of Appendix C: Environmental Methods, Data, and Metrics

What is the lake area change No-pumping vs. current for an elevation of 55.6' NAVD - to consider change in outflow to Carpenter Branch

SJRWMD Response:

As the outflow elevation of 55.6 NAVD would remain the same under no-pumping and current-pumping conditions, the lake area would not change at the specified elevation. However, the time that a given critical elevation is exceeded is a common MFLs metric, used by SJRWMD, SRWMD, and SWFWMD. For these metrics, the temporal exceedance of an elevation of interest is evaluated under various conditions. The Lake Prevatt outflow elevation (55.6 ft NAVD88) is exceeded 39.5% of the time under the no-pumping condition, and 36.7% of the time under the current-pumping condition. A potential impact threshold of 15% reduction from the no-pumping condition would result in a 33.6% exceedance. Under the current MFLs condition (based on the most-constraining metric – open water area), 55.6 ft NAVD is exceeded 32.2% of the time.

Therefore, a metric based on the temporal exceedance of the outflow elevation of 55.6 NAVD, with an allowable 15% reduction from no-pumping, would be met under current-pumping conditions and be slightly more constraining (by 1.4% exceedance) than the current MFLs condition. Additional model runs would be necessary to determine an exact UFA freeboard for this metric. However, it is important to note that any metric used for the final MFLs would need to have a strong environmental rationale. Without this, a metric based on outflow elevation exceedance would be difficult to defend.

While increased outflow from the lake may reduce water residence time, and there may be qualitative support relating this to slightly improved water quality, data are currently not sufficient to suggest that a 1.4% decrease in outflow exceedance would significantly affect water quality parameters. This is especially true for an urbanized system with high nutrient loading. Additionally, while there are no current plans for structural alterations, outflow elevations can be easily altered through sediment build-up or dredging. Metrics that can be achieved through structural alteration (e.g., lowering the outlet elevation) are not generally considered defensible as MFLs metrics. Any natural or manmade alteration to this elevation would majorly affect all other elevations of concern within the water body.

When considering percent reductions, it is also important to consider whether extremely high elevations (i.e., high in the exceedance curve) are appropriate for whole-system protection. These elevations are often storm-driven and as such very insensitive to pumping. Also, a high-elevation exceedance metric provides for, by definition, an extremely small amount of allowable change (e.g., a 15% reduction from a small exceedance %, yields a very small allowable % change). The resulting very small amount of allowable change may be considered overly constraining if not linked to specific ecological or human beneficial uses. If relevant environmental functions and values are already considered and protected by other metrics, this type of high-elevation metric (e.g., outflow elevation) would necessitate an extremely strong rationale, or may be considered not defensible.

In reference to page 77, Average Habitat Area section of Appendix C: Environmental Methods, Data, and Metrics

What is the change in lake area No-pumping vs. Current for an elevation of 57.6' NAVD - to consider a change in wetland boundary.

SJRWMD Response

Please see the notes on temporal exceedance in the comment response above. Under a no-pumping condition, the elevation of 57.6 ft NAVD is exceeded 1.3% of the time. Under a current-pumping condition, 57.6 ft NAVD is exceeded 1.2% of the time. A 15% reduction from no-pumping is an exceedance percentage of 1.1%. Under the current MFLs condition, 57.6 ft NAVD is exceeded 1.0% of the time. Therefore, a temporal exceedance of the wetland boundary elevation of 57.6 ft NAVD with a 15% reduction from no-pumping would be met under the current-pumping condition and be slightly more constraining (by 0.1% exceedance) than the current MFLs condition. Additional model runs would be necessary to determine an exact UFA freeboard for this metric. See comments above regarding high-elevation exceedance metrics, the insensitivity to pumping, and the resulting small amount of allowable change (i.e., available water). It may be hard to defend the ecological significance of a change from 1.3 to 1.0%. Therefore, it may be difficult to defend a metric based on wetland boundary exceedance, if more constraining than the open water area metric.

In reference to page 83+, MFL Determinations for Lake Prevatt section of Appendix C: Environmental Methods, Data, and Metrics

Given that the lake is and intergrade between sandhill and stable and given the fluctuation range the ecological data selected to represent the FH, MA, FL are not the most sensitive criteria. Consider the following as potentially more sensitive ecological criteria for this type of system: FH - Mean transition zone with 30-day duration, Mean Shrub Swamp 180 day non-ex, and Landward Histosol -0.61m for 30-90 days (see Richardson et al. 2009) or Mean H/HE-1.67 for FL

SJRWMD Response:

Elevations/communities chosen to represent the FH, MA, and FL are those with MFLs precedent that can be supported with available literature. SJRWMD staff agrees that the FH, MA, and FL values suggested in the main report are not the most sensitive criteria (the MFLs condition represents the most sensitive criterion); however, they are the criteria best able to be supported by current literature and MFLs precedent. It is also important to note that the hydroperiod tool metrics (especially the open water area metic) are often more constraining than conventional event-based metrics. The additional metrics suggested have been evaluated and are discussed below (Table 5).

Using a higher elevation as the magnitude for a FH does not always equate to a more constraining metric. This is often because higher elevations are more storm-driven and have a reduced sensitivity to pumping impact. In addition to this decreased sensitivity of higher elevations, the SWIDS analysis for a Transition Zone FH results in a much larger return interval (RI) of 5.7 years than the current recommended FH, allowing for > 3.5 ft of UFA freeboard. This is a good example of how increasing the FH community or elevation can result in a less constraining metric.

The lower elevations suggested for an MA or FL are more likely to be sensitive to pumping as the lower elevations in the lake are more subject to change than the upper elevations. The MA suggested in this comment, however, is not possible under a no-pumping condition (Figure 8). This is likely due to the highly fluctuating nature of the lake, and the Shrub Swamp communities at Lake Prevatt are within this most fluctuating range. Any metric not met under the no-pumping (pre-withdrawal) condition cannot be used to assess pumping impact and therefore cannot be considered further.

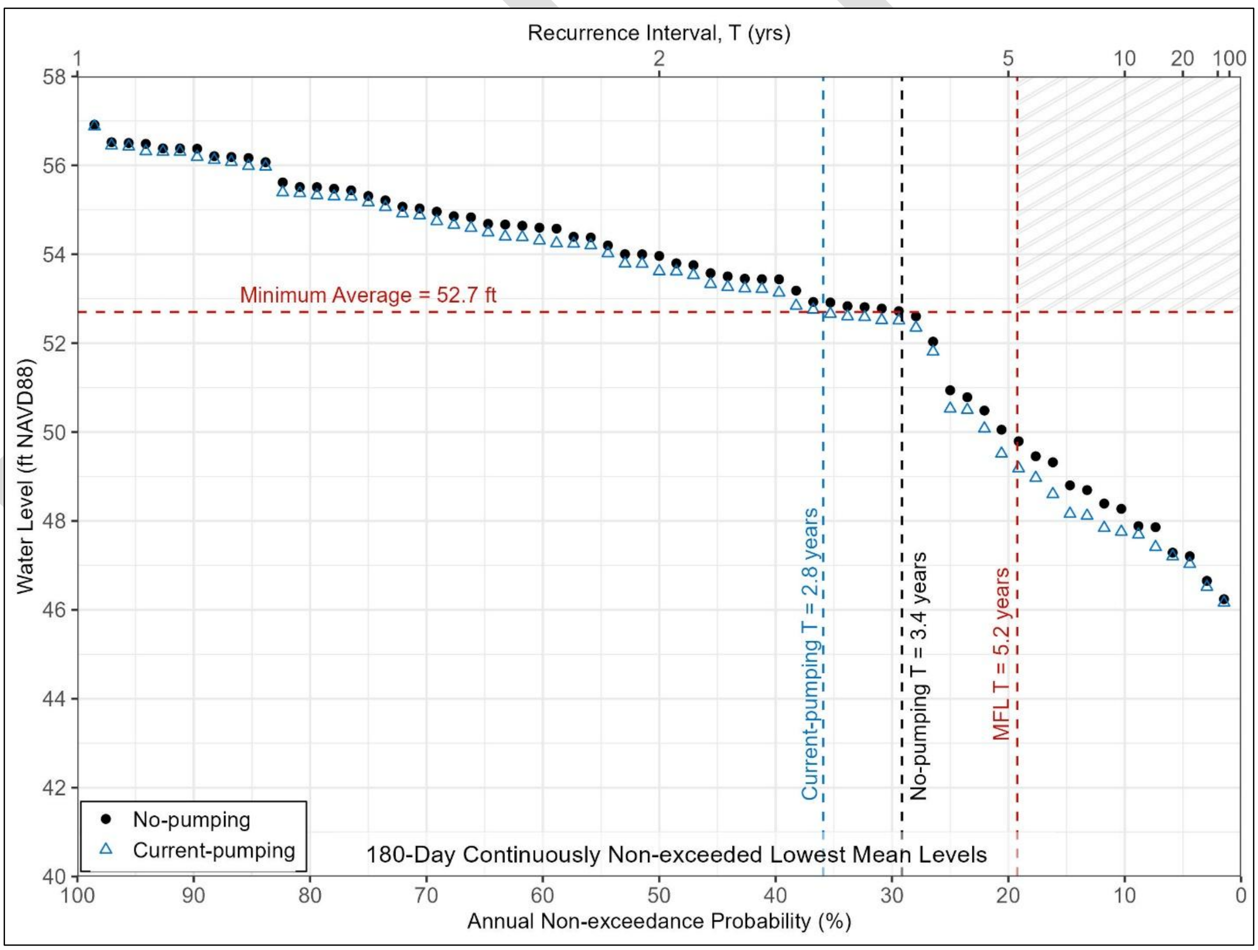

Figure 8: Weibull plot of a mean Shrub Swamp Minimum Average Level with a magnitude of 52.7 ft NAVD88, a duration of 180 days, and a return interval of 5.2 years.

The FL condition of the elevation of most landward histosol minus 0.61 m (2 ft) at a duration of either 60 or 90 days are both met under the current-pumping condition. SWIDS analysis places the return interval for the 60-day duration at 6.3 years and the 90-day duration at 8.3 years. Both FLs of the landward histosol minus 0.61 m have the same UFA freeboard as the current most constraining MFL condition of 5-ft open water. MFLs staff will research this metric further upon final report revision to determine if enough literature support can be gathered for inclusion as an official metric. However, if multiple metrics are developed to protect the same thing (e.g., the location and maintenance of organic soils and wetland vegetation) and yet they result in very different freeboards, we will likely choose to proceed with the metric with the best scientific support (e.g., MA vs soils-based FL).

Metrics suggested using a mean Histosol/Histic epipedon minus 1.67 ft also all meet under the current-pumping condition. Without guidance on a duration for this metric, 60, 90, and 120 days were all tested. A H/HE elevation minus 1.67 ft with a 60-day duration would be more constraining than the current recommended MFL; however, without sufficient rationale for use, a metric cannot be maintained for the sake of being more constraining. SJRWMD staff are open to guidance on the best use of this elevation/metric and will look for scientific support of the metric, but, as previously mentioned, will likely choose to proceed with metrics with the best scientific support.

Table 5: Additional metrics suggested for consideration by peer reviewers for Lake Prevatt. Magnitude, duration, RI, lake freeboard, and UFA freeboard are provided. Weibull plots may be provided upon request.

Metric	Magnitude (ft NAVD88)	Duration (days)	RI (years)	Lake FB (ft)	UFA FB (ft)
FH: Mean Transition Zone	55.5	30	5.7	1.6	> 3.5
MA: Mean Shrub Swamp	52.7	180	5.2	Not possible under a no-pumping condition (2.9 ft lake deficit occurring at an RI of 3.4 years under NP condition)	
FL: Landward Histosol – 0.61 m (2 ft)	48.4	60	6.3	0.3	0.9
	48.4	90	8.3	0.7	0.9
FL: Mean Histosol/Histic Epipedon -1.67 ft	48.3	60	7.6	0.1	< 0.9
	48.3	90	9.2	0.5	1.3
	48.3	120	9.7	0.7	2.3

In reference to page 109, Frequent High (FH) Level (53.8 ft NAVD88) section of Appendix C: Environmental Methods, Data, and Metrics

Consider a more sensitive criteria given the lake type and adjust the duration and return interval. E.g., transition zone. In this type of lakes the shoreline or transition zone go from inundated (killing upland plants that have encroached) to very dry allowing recruitment of upland plants. The duration needed to kill mature pine trees could be extracted from Lake Sylvan stage data (pines may have been killed following 2004 hurricane season?) Or use the wetland boundary (as Infrequent high) (see CFWI transects) with minimum hydrology required to meet the wetland definition as a measure of significant harm. see 62-340.550 FAC (inundation for 7 continuous days or saturation for 20 continuous days)

SJRWMD Response:

The comment above mentions considering more "sensitive" criteria, implying criteria at a higher elevation. Defining more "sensitive" criteria at many lakes does not necessarily equate to a higher elevation in the landscape because the upper ends of the hydrograph/exceedance curve are not sensitive to pumping but rather are dependent on rainfall and storm events. Figure 9 shows an example of the difference in exceedance curves among the no-pumping condition, the MFLs condition (current-pumping minus 0.9 ft in the UFA), and the largest UFA drawdown scenario modeled (current-pumping minus 3.5 ft in the UFA). Notice that the parts of the hydrograph most sensitive to pumping are not those at higher elevations. The most "sensitive" elevations to pumping in the record are those between a P25 and a P90.

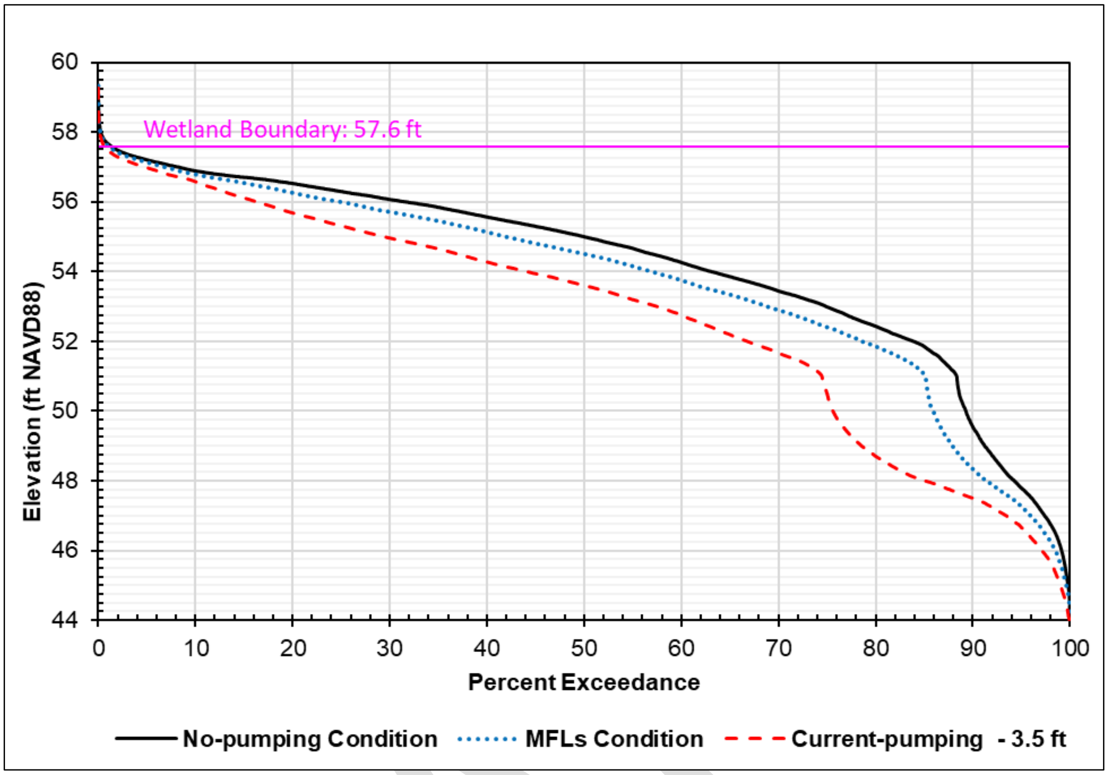

Figure 9: Exceedance curves of the no-pumping, MFLs, and current-pumping minus 3.5 ft (in the UFA) surface water level scenarios at Lake Prevatt. The largest drawdown scenario modeled (3.5 ft in the UFA) is provided to display the very little difference among no-pumping and other scenarios at the extreme high elevations at Lake Prevatt.

To address the suggestion of using the wetland boundary as an Infrequent High (IH), multiple scenarios for both saturation and inundation were tested. While 62-340.550 FAC provides guidance on the duration of inundation as 7 days and duration of saturation (6 inches within surface) for 20 days, there is no guidance on return interval besides "regularly or periodically." These terms would generally not be applied to an IH as both "regularly" and "periodically" imply a return interval more frequent than the typical 25-year return interval (infrequent) of an MFL IH. As wetland boundary data are not readily available for MFL sites, SWIDS analysis for a return interval calculation was not possible. Therefore, return intervals of 3 years, 5 years, 25 years (typical of and MFL IH), and a 15% reduction from the NP RI were tested as metrics. The results of these calculations can be found in Table 6. Due to the insensitive nature of the high elevation of the wetland boundary (P1.3 at no-pumping) metrics using this boundary are either not met under an NP condition, have a large amount of freeboard, or allow no change from an NP condition but still would have a deficit. By definition of an MFL, there must be some difference allowable from the NP condition.

Table 6: Results of Infrequent High (IH) metrics tested at Lake Prevatt using inundation or saturation of the wetland boundary.

Metric	Magnitude (ft NAVD88)	Duration (days)	RI (years)	Lake FB (ft)	UFA FB (ft)
IH: Wetland Boundary Inundation	57.6	7	3	Cannot be met under a NP condition	
	57.6	7	5	Allows no change from a NP condition but would have a deficit.	
	57.6	7	25	0.5	>3.5
	57.6	7	5.2 (15% reduction from NP RI)	Allows no change from a NP condition but would have a deficit.	
IH: Wetland Boundary Saturation	57.1	20	3	Allows no change from a NP condition but would have a deficit.	
	57.1	20	5	0.1	>2.5, < 3.0
	57.1	20	25	0.6	>3.5
	57.1	20	3.3 (15% reduction from NP RI)	Allows no change from a NP condition. Lake freeboard of < 0.1 ft.	

Slide 20 of peer reviewers' initial findings presentation (T. Richardson)

In reference to the MFLs main report

Is the adopted MFL met under current conditions?

SJRWMD Response:

Yes, the currently adopted MFLs are being met (Table 7). The 1997 FH, based on the shrub marsh – shoreline fringe ecotone, is less constraining than the recommended FH. The 1997 MA, based on a 3.5 ft flooding depth for fishery maintenance over the bottom elevation of the south lobe, is also less constraining than the current recommended MA. The 1997 FL, based on a quarter foot drawdown below the average aquatic bed, maximum elevation of muck thicker than 1ft, and a P80, was more constraining than the current discussed FL. All previous MFL metrics are less constraining than the current MFL condition based on 5 ft open water area reduction. The most constraining metric from the adopted MFL levels, the FL, has a very similar freeboard answer to the current event-based freeboards (FH: 2.5 ft, MA, 2.1 ft, FL, 2.4 ft). The most constraining of the current event-based metrics, the FH, has only a 0.1 ft difference in freeboard than the most constraining metrics developed in 1997. When multiple metrics provide similar freeboard answers despite representing varying ecological aspects of a system, the weight of evidence generally provides added confidence in the answer.

Table 7: Lake and UFA freeboard of currently adopted Lake Prevatt MFLs. Weibull plots may be provided upon request.

Metric	Elevation (ft NGVD29)	Elevation (ft NAVD88)	Hydroperiod Category	Duration	RI	Lake Freeboard (ft)	UFA Freeboard (ft)
FH	56.0	54.9	Seasonally Flooded	30	2	1.6	> 3.5
MA	53.0	52.0	Typically Saturated	180	1.7	2.2	> 3.5
FL	50.9	49.9	Semipermanently Flooded	120	5	0.7	2.0

The rational for choosing the 5 ft depth for open water habitat reduction area was to maintain the ecosystem services and fisheries (described in Appendix C) in the main body of the Lake. The 1997 MFL (Hupalo 1997) states: "The lake basin is shallow and is frequently not an open water habitat. Water depths exceed 6.5 ft in the southern basin only 20% of time. If water levels were stable, accumulating biomass would lead to a marsh environment. Cyclic replacement or oscillatory fluctuations of plant communities are the consequence of repeated cycles of flooding and drawdown." Therefore, the 5 ft open water area reduction is meant to protect Lake Prevatt similarly to the 1997 MA, but also in a manner to reduce impact to recreational values.

In reference to page 36, FH Magnitude section of the MFLs main report

Consider that the max elevation of this community (TSS) should be considered for the FH not the mean. Per Kinser - "Hydrology similar to that of cypress, hardwood swamp, or shallow marsh communities. ...lengthy seasonal inundation" or possibly mean of the Transitional Zone

SJRWMD Response:

Please see above for a discussion of a mean transition zone FH. After recalculating the return interval for a maximum Transitional Shrub Swamp, this metric would be less constraining than the current FH. The mean maximum elevation of the Transitional Shrub Swamp across all Lake Prevatt transects is 54.3 ft NAVD88. SWIDS calculation of the maximum elevation of this community results in a return interval of 1.5 years. With a 30-day duration, the lake freeboard would be 1.1 ft; the UFA freeboard would be > 3.5 ft. Despite being at a higher elevation than the FH discussed in the report, this FH is less constraining likely due to lower pumping sensitivity at higher elevations previously described.

In reference to page 38, MA Magnitude section of the MFLs main report

Consider the mean elevation of SS as the MA level. Based on Kinser description of the hydrology of this community it would seem to be an appropriate elevation for the MA level.

SJRWMD Response:

Please see above for a discussion of a mean elevation of Shrub Swamp as the MA level. The duration of this metric cannot be met under a no-pumping condition likely due to the highly fluctuating nature of the lake.

In reference to page 39, MA Magnitude section of the MFLs main report

Consider evaluating the landward most elevation (generally the max elevation) of hisitc epipedon and histosol. This may reduce variability in the SWIDS analysis by not incorporating lower elevation organics in what may be considered lake bed. See Richardson et al. 2009.

SJRWMD Response:

Please see above for a discussion of these metrics. Landward histosol will be considered as an additional metric if sufficient scientific support exists.

In reference to page 40-41, Frequent Low (FL) section of the MFLs main report

While the maximum elevation of deep marsh would normally be appropriate for a FL level for lakes with a lower fluctuation range an allowable drawdown for organic soils may be more appropriate here.

SJRWMD Response:

A previously described, if multiple metrics are developed to protect the same thing (e.g., the location and maintenance of organic soils and wetland vegetation) and they result in very different freeboards, we will likely choose to proceed with the metric with the best scientific support. SJRWMD staff and T. Richardson discussed this issue in the April 10, 2025 teleconference where both parties agreed that the current use of soils as an MA metric is more defensible than their use as a FL.

Slide 21 of peer reviewers' initial findings presentation (T. Richardson)

In reference to page 56, Recommended Minimum Levels section of the MFLs main report

Recommended levels represent a 3.6 ft fluctuation range when the lake fluctuates 12-15'. Should additional P values be represented? Does this protect the temporal components. Does use of P values effect potential enforcement. Low lake levels are likely the most critical for fish habitat and susceptible to UFA drawdown. These P values do not seem to address low lake levels.

SJRWMD Response:

The recommended MFL percentiles (P values of comment) are based on the water level regime equal to a 15% reduction in 5-ft open water area of Lake Prevatt. While the lake does fluctuate about 13 ft, the P10 to P90 range is much less (7.4 ft under an NP condition), and adopting the three percentiles (25, 50, and 75) ensures that the entire curve will be protected. If only a P50 was adopted, other parts of the exceedance curve may shift without impacting the P50, but if the 3 percentiles are adopted and upper or lower elevations begin to shift, they will change the overall P25 and P75 as well. The drop off in lake level at a P88 and higher in the exceedance curve occurs at an elevation of 51 ft NAVD88 where the lake lobes become disconnected: these higher percentiles (i.e., lower elevations) are representative of the change in lake morphology. By protecting the water level regime with three percentiles, low lake levels and high lake levels are both addressed. High or low levels cannot be drastically reduced without also reducing the other elevation percentiles in the exceedance curve.

The lake lobe connection elevation of 51.0 ft NAVD88 could be explored as a critical elevation point. Lake lobe connectivity is a common metric explored at MFL lakes, intended to maintain recreational (e.g., canoe/kayak passage) as well as ecological (e.g., fish passage) functions and values. This metric is based on the minimum water depth required for lake lobe connectivity to which an offset is added to provide sufficient depth for boating of other forms of recreation. As large watercraft cannot access Lake Prevatt, an acceptable offset would be a 20-inch offset from the bottom elevation. The offset (20") was chosen based in part on a 2004 environmental value assessment conducted on the St. Johns River that reported the draft of small flat bottomed jon boats of 16 ft or less to be usually 1.5 ft or less (HSW 2004). The boat depth suggested by the HSW study is also consistent with an FDEP study that suggests that a minimum of 20" water depth is required for protecting bottom vegetation damage from paddling and boat prop actions. This study was conducted to determine the likelihood of "paddle gouging" of submerged vegetation within the Wekiva River basin by canoeists and boat propellers (FDEP 1990). The chosen minimum paddling depth (20") is also consistent with canoe paddling depths used by Suwanee River Water Management District in MFL determinations. For an implementation of lake lobe connectivity with this offset, please refer to the Lake Butler MFL (Jennewein et al. 2022) where this metric was the most constraining.

Table 8 addresses lake lobe connectivity at Lake Prevatt using the 51.0 ft connection point and a 20-inch (1.67 ft) offset for recreational connectivity. The lake lobe connection metric will be added to the final MFL report for complete documentation of the metric.

However, compared to the current recommended MFL condition, the elevation of 52.67 ft NAVD88 could be reduced an additional 6.36%. Therefore, the recommended MFL metric of 5-ft open water is still the most constraining.

The MFLs condition, and the open water metric on which it is based, is expected to protect the temporal components needed to protect all other event-based vegetation and soils metrics. The District will monitor the status of the adopted minimum P25, P50, and P75 as well as the constraining metric (open water area) on which they are based. All original metrics will be evaluated to ensure they are protected in addition to the three water level percentiles.

To address whether low lake levels "critical for fish habitat and susceptible to UFA drawdown" are protected, we can first reference the change in game fish spawning habitat evaluated with the HT. Elevations corresponding to 1.0 – 4.0 ft of water through time were evaluated to ensure that there was not greater than a 15% reduction under current-pumping. Under a current-pumping condition, this metric (> 3.5 ft UFA freeboard) was far less constraining than the open water 5 ft metric (0.9 ft UFA freeboard). Therefore, by protecting the more constraining metric, the less constraining metrics are also protected.

We could also address fish kills with a temporal exceedance approach. Hupalo (1997) reports that a fish kill occurred after water levels receded to 47.0 ft NAVD88 where the available water habitat had been reduced to 0.25 acres. Largemouth bass, sunfish, and lake chubsucker were found around the perimeter of the remaining water body of the lake. Table 8 provides comparisons of a series of elevations under a 15% temporal exceedance change from NP. Elevations 47.0 - 51.0 ft NAVD88 represent the elevation of the recorded fish kill and 3 offset elevations (plus 2, 3, and 4 ft). The most constraining of these four values (fish kill + 3 ft) would still allow for drawdown below 50.0 ft NAVD88 10% more often than the recommended MFLs condition. The 51 ft elevation is not the most constraining of these four elevations because surface water is supplemented from the north lobe starting at this elevation.

Table 8: Examples of temporal exceedance metrics of fish kill and lobe connection elevations.

Elevation (NAVD88)	Percent Exceedance under NP condition	15% from NP exceedance	Percent Exceedance under CP Condition	Percent Exceedance in Recommended MFLs Condition	Additional percent allowable change from recommended MFLs Condition
47.0	97.39	82.78	96.85	95.95	13.16
49.0	91.22	77.53	89.61	87.90	10.36
50.0	89.29	75.89	87.63	85.88	9.99
51.0	88.33	75.08	86.70	85.12	10.03
52.67	77.70	66.04	75.42	72.41	6.36

In reference to page 57, Recommended Minimum Levels section of the MFLs main report

P25 - elevation lines up in the TZ, P50 lines up with Max TSS, P75 lines up with max SM. Again this suggests that most sensitive ecological transect data was not applied.

SJRWMD Response:

Please see the previous discussion of using a mean Transition Zone or max Transitional Shrub Swamp for a FH or the mean Shrub Swamp as an MA. The P25, P50, and P75 are not meant to be representative of a FH, MA, and FL. Upon final revision of the MFLs report, the previous and recommended MFLs summary table will be split to eliminate this confusion. As discussed above, moving upslope in this type of system (i.e., basing event-based metrics on higher elevations) does not typically result in more constraining metrics. In contrast, these higher elevations are typically storm-driven and less sensitive to pumping impact.

Slide 23 of peer reviewers' initial findings presentation (T. Richardson)

In reference to page 9, Event-based Metrics section of Appendix D: MFLs Status Assessment

Table D-3: The MA and FL criteria allow about a 50% increase in the frequency of low water events. Are the best metrics evaluated? Does the SWIDS analysis with mean – or + SE result in an appropriate RI?

SJRWMD Response:

Please see above discussions of other possible metrics. We do believe that the best metrics, defined by defensibility, weight of evidence, and pumping sensitivity, are being evaluated. The goal of the SWIDS analysis is to calculate RIs in the most repeatable, defensible, and objective way possible. As described in Appendix C, the result of updating the SWIDS process was a major reduction in the range of return intervals of the vegetation metrics and a slight reduction in the return interval range for soils. Using the mean +/- SE in the RI calculation is performed only after major outliers are removed in the clustering process.

The variability inherent in ecological data, especially among different sites, is the reason why various metrics are explored at each MFL site. When multiple metrics provide similar answers, a weight of evidence can support the use of more applicable metrics over ones that may not be appropriate for a given system. While the current MA and FL criteria allow a large increase in the frequency of low water events, they are defensible and considerably more constraining than other metrics analyzed. Of the metrics analyzed as part of the main Lake Prevatt MFL, the freeboards of the MA (2.1 ft) and FL (2.4 ft) metrics are comparable with the freeboard of the emergent marsh (2.5 ft) and overall lake area reduction (2.2 ft). The FH, based on the mean elevation of the Transitional Shrub Swamp, has the same amount of freeboard as the emergent marsh HT metric (2.5 ft). The agreement of multiple metrics with similar freeboard, and the exploration of other possible FHs, MAs, and FLs with far more freeboard (and less scientific support) suggest that the best metrics have been evaluated. The only metrics more constraining are the canoe metric (1.7 ft freeboard) and the open water metric on which the MFL is based.

Comments made by Mr. Dan Schmutz, GPI, on 4/10/2025:

Rainfall analysis needed to confirm groundwater model results and surface water model results

Comments made by Jay Exum, Friends of the Wekiva River, on 2/25/2025 Peer Review Kickoff Meeting:

Based on these slides, it seemed intuitive to me that the lake would have experienced drawdown due to groundwater pumping. My question was whether the stage data depicting a drop in lake levels in Lake Prevatt was determined to be statistically insignificant from previous years, or when coupled with rainfall, consistent with trends prior to 1980? But, if the declines are as significant as they appear, how do they not result in impacts to hydrological and ecological functions?

SJRWMD Response to Mr. Dan Shmutz and Dr. Jay Exum:

We believe we have addressed all concerns regarding rainfall and pre/post- 1980s water levels conditions. Please see above responses. Some key points of the pre/post- 1980s discussion include:

- The lake did experience drawdown due to groundwater pumping. The amount of drawdown is incorporated in the current-pumping condition. Differences in the no-pumping and current-pumping conditions are most apparent during drought periods. Groundwater pumping has been incorporated into MFLs analyses and MFLs model development.
- The drop in lake levels post-1980 were majorly influenced by climatic conditions. During wetter periods (pre-1980), the effective watershed of Lake Prevatt is larger due to north lobe inflow and contribution of water from the north lobe to the south lobe at water levels above 51 ft NAVD88. During drier periods, the effective watershed of the south lobe is reduced in area. Water lost through seepage and evaporation cannot be as easily maintained without inflow from the north lobe, resulting in more water level variability with drought. Increases in water levels still occur after large rainfall events due to the small, shallow nature of the basin.
- The flashy nature of lake levels post-1980 are likely due in part to increased development within the Lake Prevatt watershed. Increases in impervious surfaces in urban watersheds are known contributors to changes in baseflow and stormwater runoff to lake systems (see discussion in first response above).

Response Summary

- Pre- vs post-1980 differences in water levels are possible, even with low pumping impact, given the large differences in deficit rainfall and watershed development in these two periods. The latter can dramatically alter hydrology by changing water storage, infiltration, runoff, and ET. Higher water level fluctuations also occur at lower water levels as the effective watershed shrinks when lake levels drop below 51 ft NAVD88.
- The difference in community elevations between 1997 and current work is not unexpected given 1) 25 years elapsed and antecedent climate conditions were different, and 2) differences in transect location can result in differences in elevation
- Despite the assumption that earlier (i.e., 1997) metrics are more protective (because elevations are higher), the current recommended MFLs are more constraining (lower freeboard) than the original adopted MFLs.
- The recommended MFLs condition (based on the open water area metric) is more constraining than suggested metrics to protect the wetland boundary, depths to prevent fish-kills and outlet elevation exceedance.
- Metrics created for the MFL need to be derived from ecological rationale, then tested. Metrics that are constraining without sufficient environmental rationale cannot be defended.

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