

DRAFT
**Technical Support Document in Support of Data Quality Screening of
Water Quality Data Collected During the May and June 2005
Monitoring Events for the EVPA (LOX) Project**

The Department has reviewed the available information relative to assessing the quality and validity of the data collected during the May and June 2005 sampling events at the 14 LOX marsh sites located in the Arthur R. Marshall Loxahatchee Wildlife Refuge (Refuge) as part of the EVPA (LOX) Project. The information evaluated during this review included the 1) data (lab and field data) collected during the referenced monitoring events as well as preceding and subsequent monitoring events, 2) field notes collected by the samplers, 3) the Marsh Field Sampling Protocol prepared in 1996 by Frank Nearhoof of FDEP, and 4) the 8/11/05 Assessment document prepared by D. Ivanoff of the South Florida Water Management District (SFWMD).

The SFWMD's 8/11/05 assessment was prepared to assess the validity of the data collected during May and June 2005 and to determine if further action is needed to ensure that the data generated for this project are of acceptable and verifiable quality. In this assessment, the SFWMD evaluated the data for the referenced events, and after finding questionable trends, proceeded to evaluate possible causes, including possible errors. The SFWMD report provides information regarding the methods utilized for data and sample collection obtained through interviews with the sampling personnel. This information was then used to determine if required sampling SOPs and protocols were followed during the monitoring events in question and to evaluate the possibility that poor sampling technique caused the abnormal results obtained for these events.

The SFWMD report concluded that the high phosphorus concentration observed during the May and June 2005 sampling events were the result of high solids content (TSS) also reported for the samples. The source of the high levels could not be determined definitively, but poor sampling technique by inexperienced samplers was identified as a likely cause.

The Department has conducted an independent evaluation of the data and concurs with the conclusions from the District report regarding the usability of the May and June 2005 Refuge EVPA data and the likely cause of the high phosphorus concentrations. Figure 1 shows the strong correlation ($r^2=0.8$) between TSS and phosphorus concentrations at the LOX sites in the Refuge. It can also be noted that the two highest TSS levels recorded for the LOX sites during the 1994-2005 period of record were reported for the May and June 2005 sampling events. In addition, the inclusion of abnormally large amounts of particulate matter in selected samples collected during the May and June 2005 sampling events was also noted by the laboratory staff during sample processing. Furthermore, the extremely high value for the field cleaned equipment blank on May 16, 2005 raises concern that improper sampling techniques and/or contaminated equipment or preservatives were used by the sampling staff, provides an additional indication that the sample staff lacked sufficient experience.

Due to the strong influence of TSS on measured phosphorus concentrations, the accepted Everglades marsh sampling protocols (as well as DEP SOPs) warns that it is essential that every precaution be made to prevent disturbance at a sampling location that would result in the

inclusion of excess TSS. This precaution is especially important when water levels are low (as during these events) or when wading to a sampling site or attempting to sample from an air-boat or helicopter. In fact, sampling at or near an air-boat or helicopter is not generally recommended due to the high level of disturbance they cause due to prop wash, disturbance to vegetation, disturbance of floc and sediment, and compaction of the sediment. It is also important to note that TSS can be composed of disturbed floc/sediment or epiphytic or floating periphyton disbursed into the water column through excess agitation of the vegetation or the water's surface.

Recommendations

Based on their assessment, the District's report makes recommendations regarding the handling of the data from the May and June 2005 sampling events and corrective actions that need to be taken to prevent a reoccurrence in the future. The District's recommendations are:

- 1) Flag all data for the May and June 2005 sampling events with a "?" qualifier; add a comment: sampling quality is questionable based on sampling assessment findings.
- 2) Require improved training and demonstration of capability by sampling personnel prior to being involved in the project.
- 3) Require routine collection and analysis of TSS samples to be used as a step in the data validation process.
- 4) Finalize the development of a project specific Monitoring Plan that would identify and communicate the details, goals and objectives, and protocols to project participants.
- 5) Develop and implement SOPs covering various aspects of the project including sampling methods, data verification and validation, field project management, and data assessment.

Based on the Department's evaluation, we concur with the District's recommendations concerning the needed corrective actions and would urge the District and Refuge staff to implement the corrective actions as soon as possible. However, we do recommend making the modifications/clarifications described below.

The Department concurs that all data for all water quality parameters for the May and June 2005 sampling events should be flagged with a "?" qualifier. Due to the strong probability that the invalid data resulted from improper sampling techniques utilized by inexperienced personnel presumably throughout the entire monitoring events in question, serious questions exist concerning the validity of all the data collected in this manner. Also, parameters other than phosphorus are definitely affected by the inclusion of high levels of TSS in the sample, so the data qualification should not be restricted to TP and TSS results. Furthermore, the Department concurs with the use of the "?", which conveys the magnitude of the error; the fact that a large portion of the data are clearly not representative of ambient marsh conditions; and, indicates that the data should be rejected from any further assessments.

We believe some discussion is needed about the District's recommendation to require TSS sampling and analyses be performed on a routine basis to aid in the assessment of data validity. The concept is sound, but there are logistical considerations, which should be discussed during

the upcoming marsh sampling training workshop. We agree that TSS should be collected from the same grab sample as that used for TP. If two separate bottles are used, one for nutrients and one for TSS, it's possible that a disturbance of the floc during the period between collecting these two bottles would make the results not comparable to one another. If the TSS was collected first, but then the sediment were stirred prior to collecting the TP sample, and the TP results were high, one would erroneously conclude the high TP results were valid. A large bottle may be impractical to use during low water events, which would then require use of a small bottle to fill up a mixing vessel, the contents which of which would then be transferred to the necessary bottles (acid preservatives in some, thermal preservation in others).

Only highly and experienced trained field staff, exercising due caution and sampling according to the SOPs, can ensure that a representative marsh water sample is obtained. While the extraordinarily high TSS measurements during the May and June samplings indicated problems, relying only on “after the fact” TSS measurements to assess how well staff are sampling is not a long term solution. A multi-tiered approach, involving comprehensive training, field performance testing, documentation, and data assessment and validation is needed to address ongoing and future QA concerns.

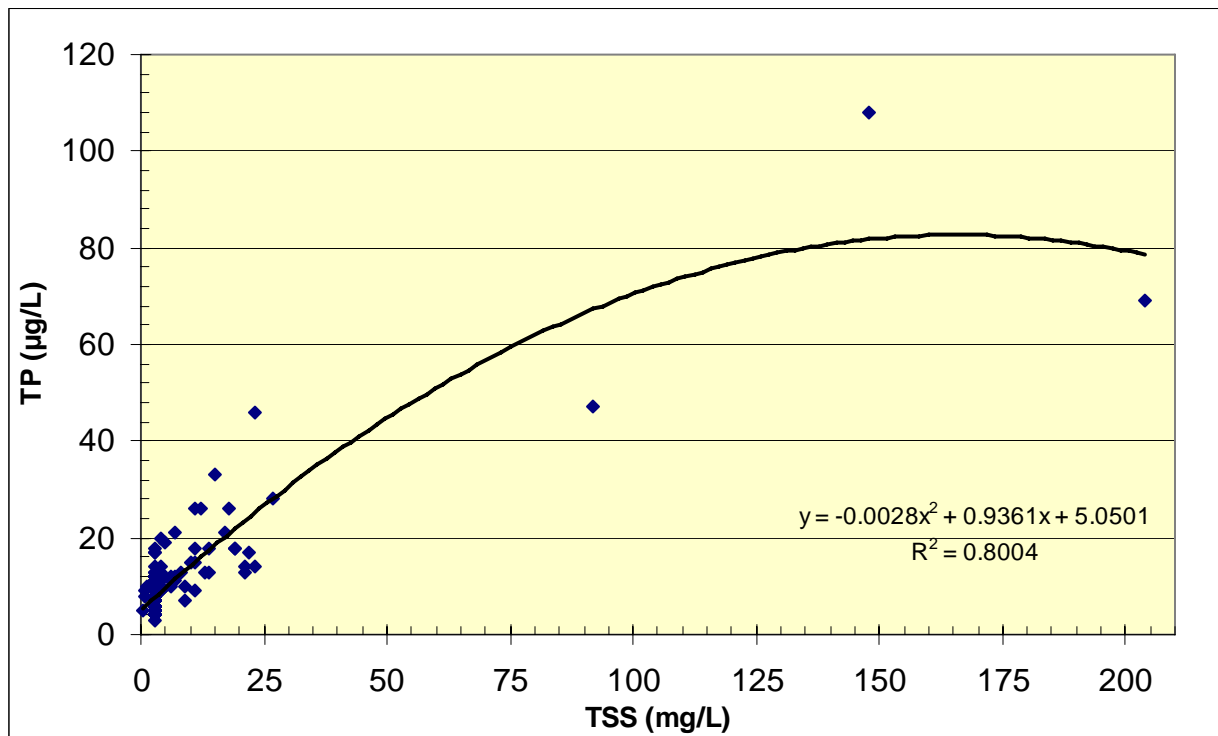


Figure 1. Relationship between TSS and TP concentrations at 14 LOX sites in the Refuge during the period from January 2003 to July 2005
(Note: samples with two highest TSS concentrations were collected during the May and June 2005 monitoring events.)