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Environmental and Natural Resource Management Consultants

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31 October 2007

Samuel S. Stone
Environmental Affairs Coordinator
Peace River Facility
8998 S.W. County Road 769
Arcadia, FL 31269

RE: Horse Creek Stewardship Program
Total Nitrogen and Total Fatty Acids Impact Assessment for June 2007
Developed on behalf of Mosaic

Dear Mr. Stone,

The impact assessment you requested for the Horse Creek Stewardship Program June 2007 sampling event is attached. The history of nitrate+nitrite data collected as part of the HCSP indicates that the HCSW-3 and HCSW-2-FD samples for nitrate+nitrite, and therefore total nitrogen, may be suspect. Additionally, the lack of mining and mining discharge in the Horse Creek Basin for the last twelve months makes it unlikely that either the total nitrogen or total fatty acid exceedances were caused by mining activities. Please contact us if you have any questions or comments.

Sincerely,

BIOLOGICAL RESEARCH ASSOCIATES

Kristan Robbins
Ecologist/Data Analyst

Douglas J. Durbin, Ph.D
Senior Water Resource Analyst/Technical Director

Enclosure: Total Nitrogen and Total Fatty Acids Impact Assessment June 2007



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IMPACT ASSESSMENT FOR JUNE 2007 EXCEEDANCE OF TOTAL NITROGEN AND TOTAL FATTY ACIDS TRIGGER LEVELS

Prepared on behalf of:



Prepared by:



October 2007

Kristan Robbins

Douglas J. Durbin, Ph.D

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Samuel S. Stone
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Background

This report was prepared as a component of the Horse Creek Stewardship Program (HCSP). The HCSP plan document requires that an “impact assessment” be conducted for any trigger level exceedances or water quality trends found while preparing the annual HCSP report. However, this assessment is being proactively provided at the request of Sam Stone of the Peace River Manasota Regional Water Supply Authority (PRMRWSA) based on monthly monitoring data not yet incorporated into an annual report.

As part of the HCSP, Mosaic monitors four locations monthly on Horse Creek for a number of water quality parameters. Most of the monitored parameters have trigger levels that are set to track conditions in the stream. The trigger level for total nitrogen is exceeded above 3.0 mg/L, and the trigger level for total fatty acids is exceeded above 0.5 mg/L. In June 2007, total nitrogen at HCSW-3 at State Road 70 (9.68 mg/L) and the field duplicate (but not primary sample) at HCSW-2 at Goose Pond Road (15.40 mg/L) exceeded the trigger level. In addition, total fatty acids at HCSW-1 at SR 64 (1.5 mg/l) and at HCSW-2 at Goose Pond Road (1.6 mg/L) exceeded the trigger level. All of the HCSP total nitrogen and total fatty acids sampling data is presented below. In addition, TKN and nitrate+nitrite sampling data is also presented.

Total Nitrogen

The June 2007 total nitrogen values represent the maximum total nitrogen levels observed at HCSW-2 (field duplicate) and HCSW-3 for the duration of the Stewardship Program that was initiated in April 2003 (Table 1). In contrast, the June 2007 total nitrogen levels for HCSW-1 and HCSW-4, as well as the primary HCSW-2 sample, were not near the maximum recorded for each station (Figure 1). The total nitrogen measured at HCSW-3 and HCSW-2 (field duplicate) in June 2007 was an order of magnitude greater than samples collected in the preceding and following months (Figure 1), a condition not observed in 50 months of monitoring. The field duplicate of HCSW-2 total nitrogen in June 2007 was the only field duplicate to measure more than 1 mg/L from the total nitrogen value of the primary sample.

Prior to June 2007, total nitrogen has exceed the trigger level just once since the Stewardship Program began in April 2003. In September 2006, the total nitrogen trigger level was exceeded at HCSW-3, because TKN was 6.6 mg/L (Figure 2). TKN is usually the major constituent of total nitrogen during all sampling event at all stations (Figures 1 and 2). Nitrate+nitrite is usually below 1 mg/L at all stations (Figure 3). Therefore, it is quite anomalous that nitrate+nitrite was above 9.0 mg/L at two stations in June 2007, while TKN was much lower.

Table 1. Summary statistics of Total Nitrogen, TKN, and Nitrate+Nitrite levels at Horse Creek Stewardship Program monthly sampling stations (including associated field duplicates) from April 2003 to August 2007.

		HCSW-1	HCSW-2	HCSW-3	HCSW-4
		State Road 64	Goose Pond Rd	State Road 70	State Road 72
Total Nitrogen	Minimum	0.23	0.13	0.32	0.25
	Median	1.02	1.30	1.16	1.37
	Mean	1.05	1.58	1.45	1.31
	Maximum	2.00	15.40	9.68	2.70
TKN	Minimum	0.13	0.50	0.18	0.15
	Median	0.89	1.20	0.96	0.90
	Mean	0.94	1.30	1.07	0.94
	Maximum	1.90	4.40	6.60	2.60
Nitrate + Nitrite	Minimum	0.01	0.01	0.01	0.01
	Median	0.10	0.09	0.15	0.33
	Mean	0.11	0.28	0.38	0.37
	Maximum	0.48	11.00	9.50	1.26

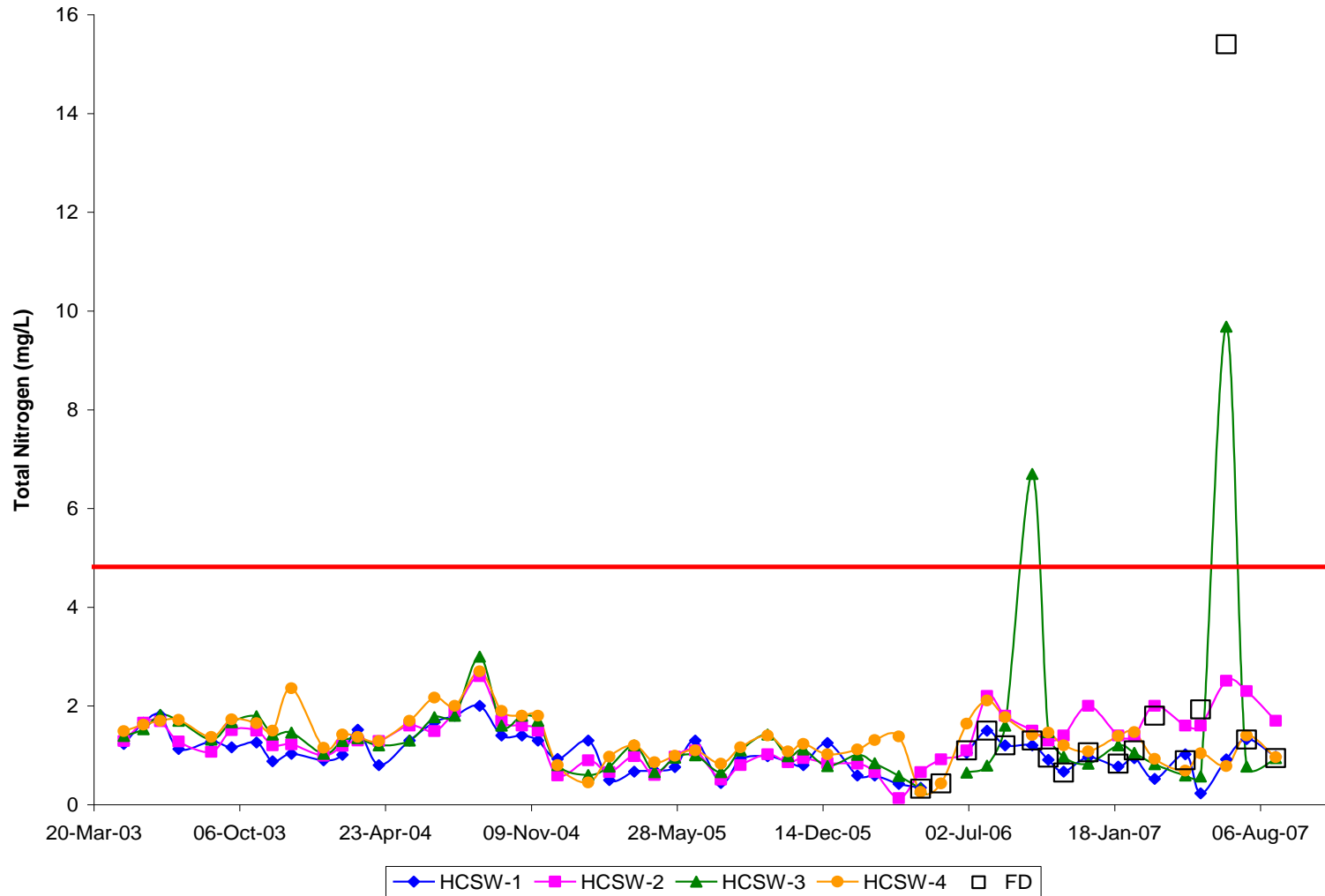


Figure 1. Total Nitrogen at Horse Creek Stewardship Program monthly sampling stations from April 2003 to August 2007, including field duplicates. The solid red line represents the HCSP trigger level.

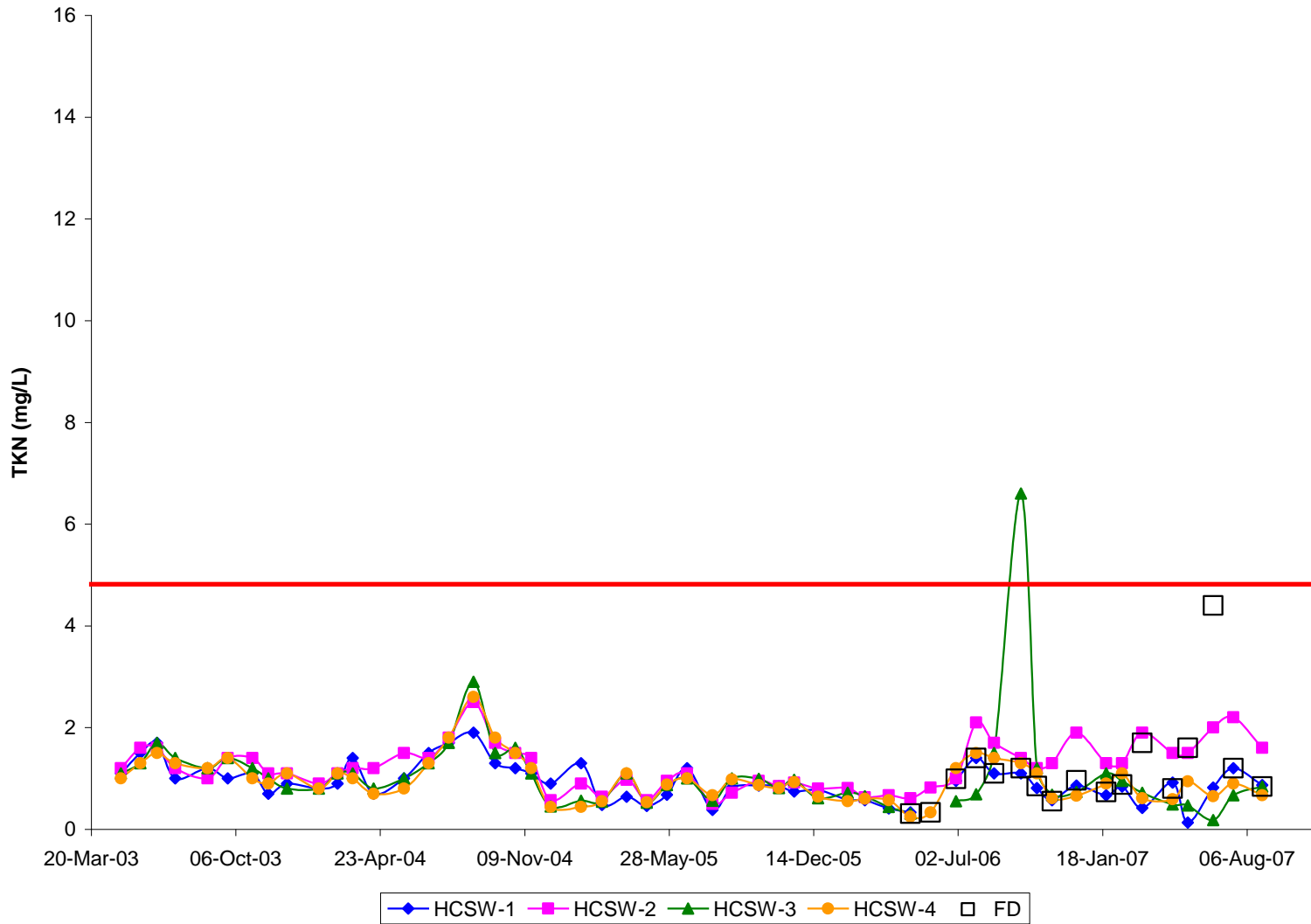


Figure 2. TKN at Horse Creek Stewardship Program monthly sampling stations from April 2003 to August 2007, including field duplicates. The solid red line represents the HCSP trigger level.

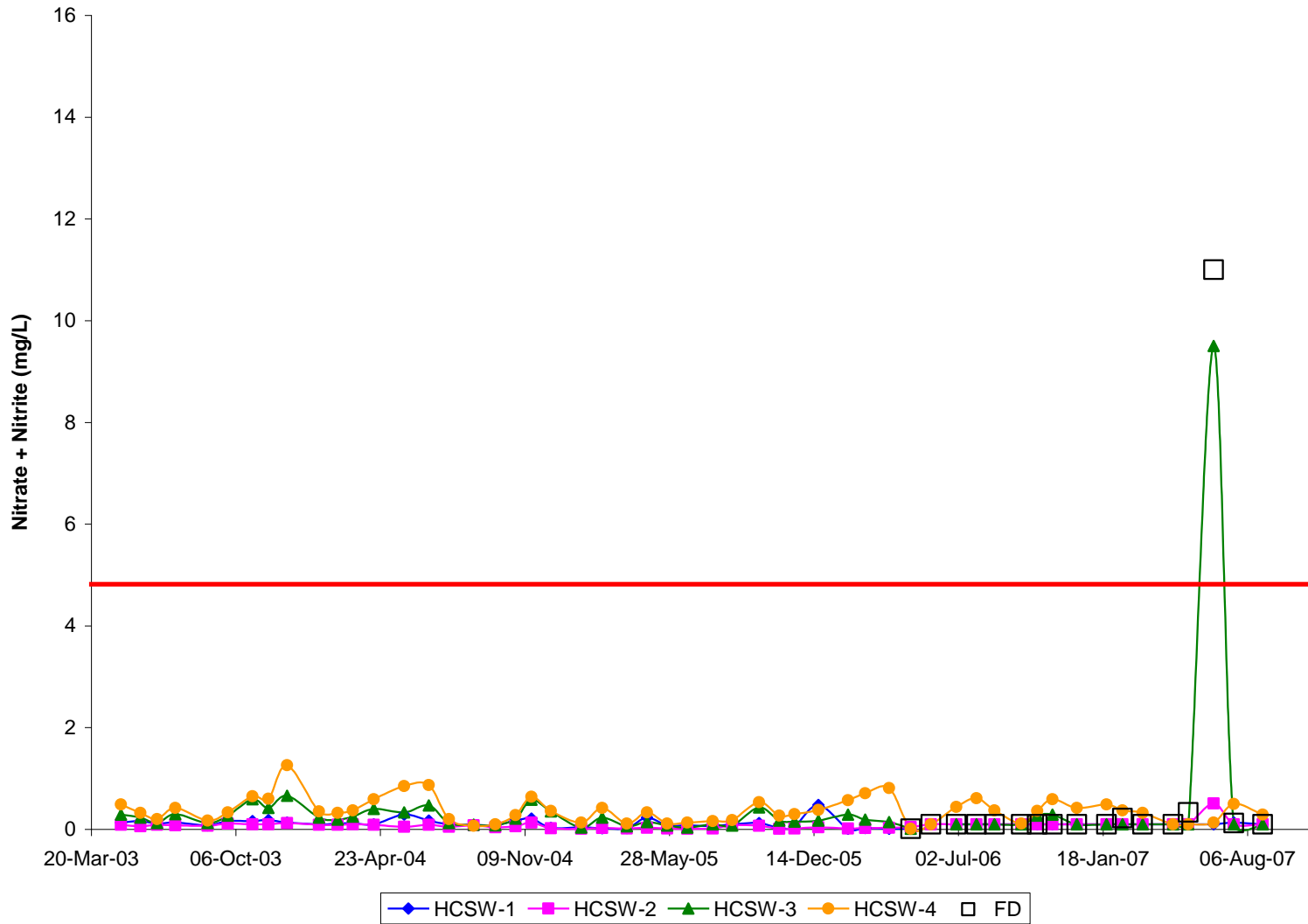


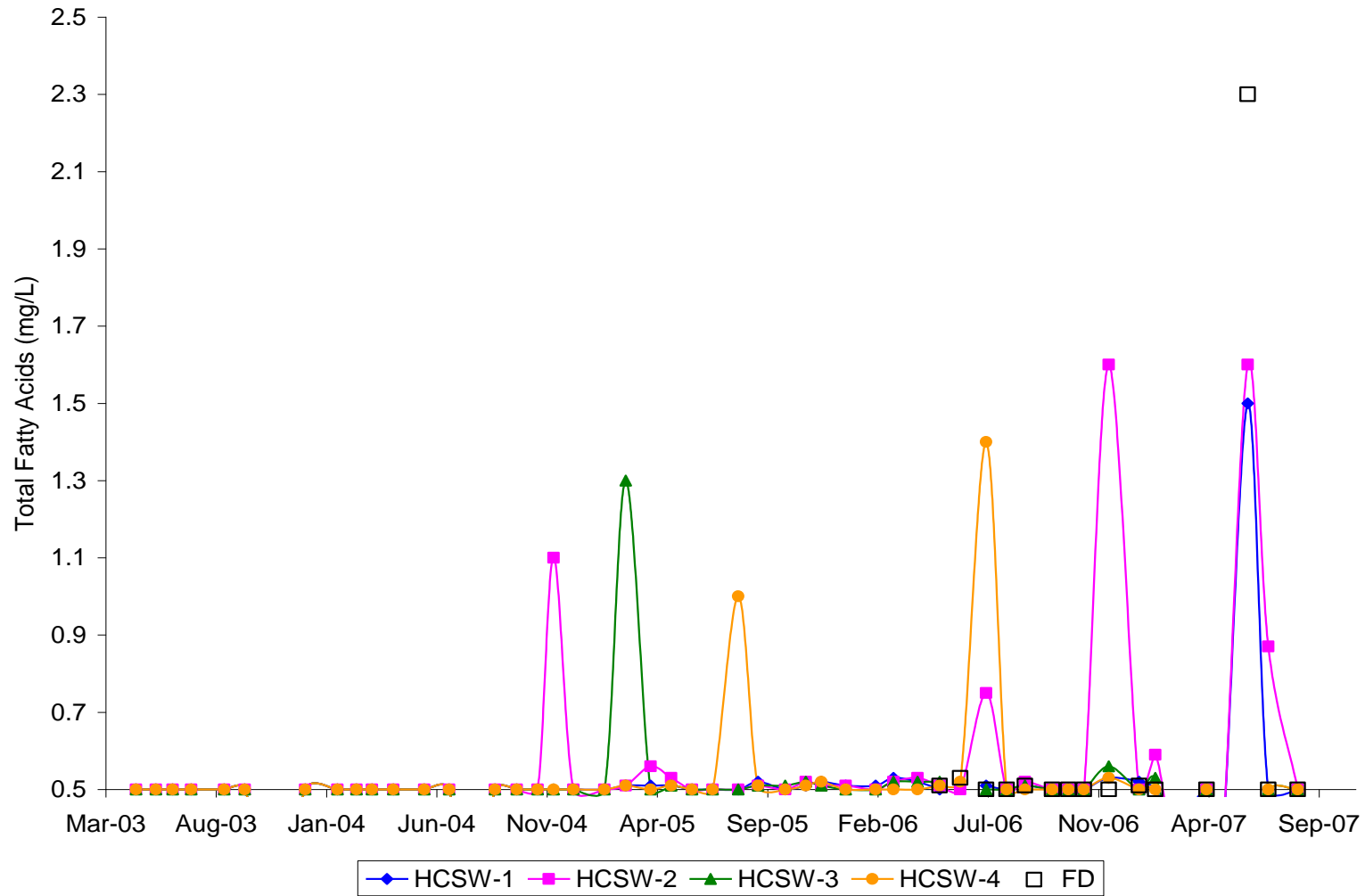
Figure 3. Nitrate + Nitrite at Horse Creek Stewardship Program monthly sampling stations from April 2003 to August 2007, including field duplicates. The solid red line represents the HCSP trigger level.

The history of total nitrogen sampling throughout the HCSP indicates that the June 2007 HCSW-3 and HCSW-2 (field duplicate) total nitrogen measurements are suspect. Those measurements are the highest ever recorded at those HCSP stations, other measurements taken within a month of the event are not elevated, and the field duplicate is significantly different than the primary sample. In addition, unusually high (9x normal) nitrate+nitrite was the major constituent of the samples that exceeded total nitrogen, but TKN is the major constituent of total nitrogen for all stations in all other events. It is particularly important to note that only the field duplicate from HCSW-2 showed elevated nitrate+nitrite, while the primary sample showed a typical level, which strongly indicates a problem in sample collection, lab analysis, or data entry.

In conclusion, there is considerable doubt that the elevated total nitrogen levels reported by the laboratory for June 2007 at HCSW-3 and HCSW-2 (field duplicate) were real. Instead, the measurements in question are most likely the result of lab analyst or instrument error. The high total nitrogen levels recorded during the June 2007 sampling event are not corroborated by measurements taken before or after that event. In addition, Mosaic has not mined any land in the Horse Creek basin since June 2006, nor discharged water from mining operations in the basin since March 2006.

Total Fatty Acids

Each of the stations have had isolated events where total fatty acids were detected above the trigger level of 0.5 mg/L (Figure 4). HCSW-2, located downstream of a slow-moving swamp, has been detected above the trigger level seven times, including in June and July 2007. Downstream stations HCSW-3 and HCSW-4 have each had one sampling event with elevated levels of fatty acids. An impact assessment has already been conducted for these stations in the past, and mining was determined not to be a factor in the elevated levels of fatty acids. The station closest to lands that have been mined, HCSW-1, had its first elevated fatty acid level in June 2007. Fatty acids were undetected at this station in July and August 2007.



June 2007 Exceedance

Figure 4. Total Fatty Acids at Horse Creek Stewardship Program monthly sampling stations from April 2003 to August 2007, including field duplicates. The solid red line represents the HCSP trigger level. The MDL (commonly) and trigger level is 0.5 mg/l; actual concentrations are lower, if present.

A study sponsored by the Florida Institute of Phosphate Research (FIPR) examined the fate of mining reagents, such as amines, fatty acids, and fuel oil, in the environment (Patel and Schreiber 2001). The FIPR study specifically examined the rate of biodegradation and soil leaching of these organic compounds in a controlled environment. The researchers concluded that fatty acids were readily biodegradable, did not leach through either sandy overburden or clay soils, and did not migrate to the aquifer systems. Therefore, very little fatty acid from mining operations is free in the environment.

In light of these findings, and because mining and mining discharge have not occurred in the Horse Creek Basin since at least June 2006, it is highly unlikely that fatty acids from mining process water are responsible for the elevated fatty acid levels seen at HCSW-1 in 2007. It is more likely that this elevated concentration, as well as those measured periodically at other stations, represents the variation in naturally-occurring fatty acids in Horse Creek.

Literature Cited

Patel, S. K. and A. E. Schreiber. 2001. Fate and consequences to the environment of reagents associated with rock phosphate processing. Prepared for Florida Institute of Phosphate Research. Bartow, Florida. 91 pp.