

Measuring the Ability of Floodplains to Treat Urban Runoff in the Lake Tahoe Basin (P040)¹

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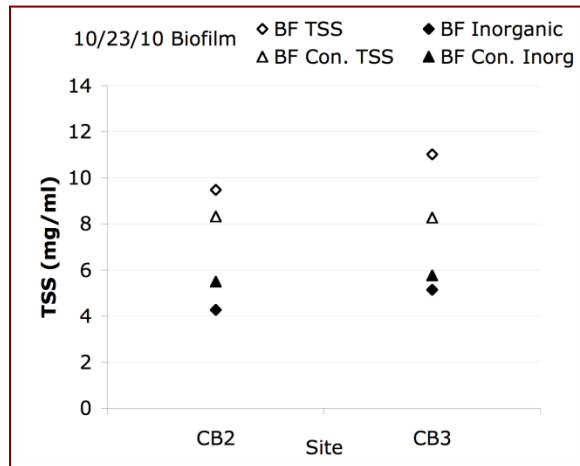
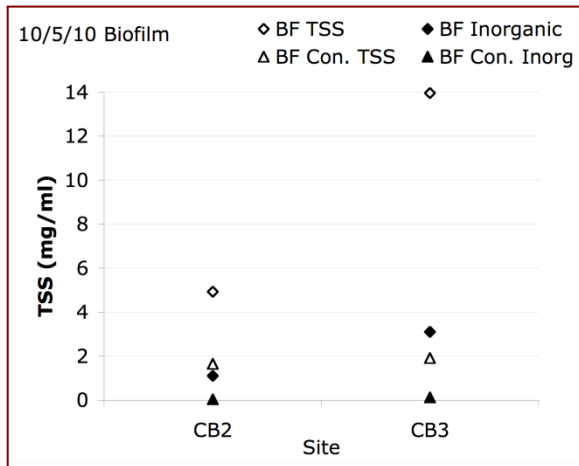
Progress Report: October 1, 2010 to December 31, 2010

Preliminary data:

We have preliminary data for two storms in October 2010. Results are presented below.

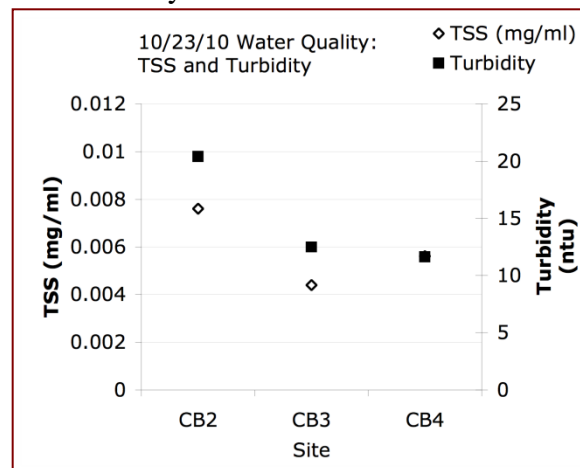
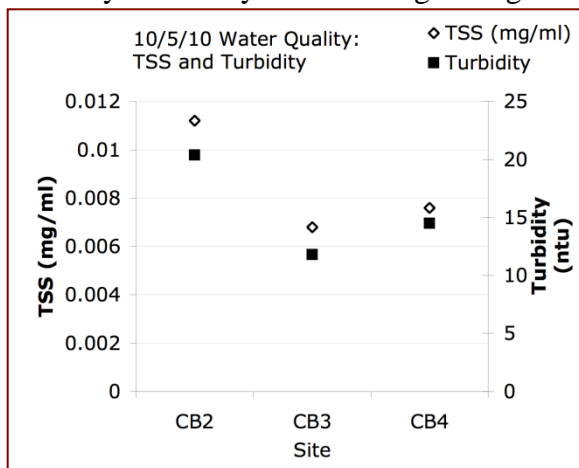
Biofilm: The 10/5/10 biofilm data shows a clear increase in inorganics on the plates treated with biofilm. The 10/23/10 captured fewer inorganics on the treated plates than the control.

Storm Date	10/5/10	10/23/10
Date installed	9/18/10	10/23/10
Notes	Biofilm installed several weeks before storm. Perhaps some dust deposited on the surface from the air.	Biofilm installed during the storm. Water was already flowing on the floodplain so the first flush was missed.



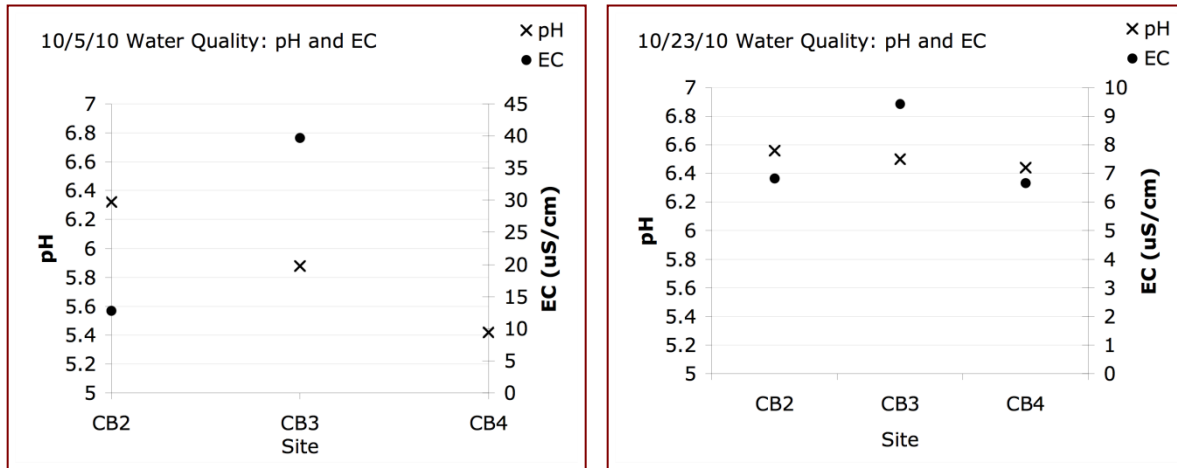
TSS: All the TSS appears to be VSS. This is strange since we are expecting some inorganics.

Turbidity: Turbidity is decreasing through the basin and may correlate with TSS.

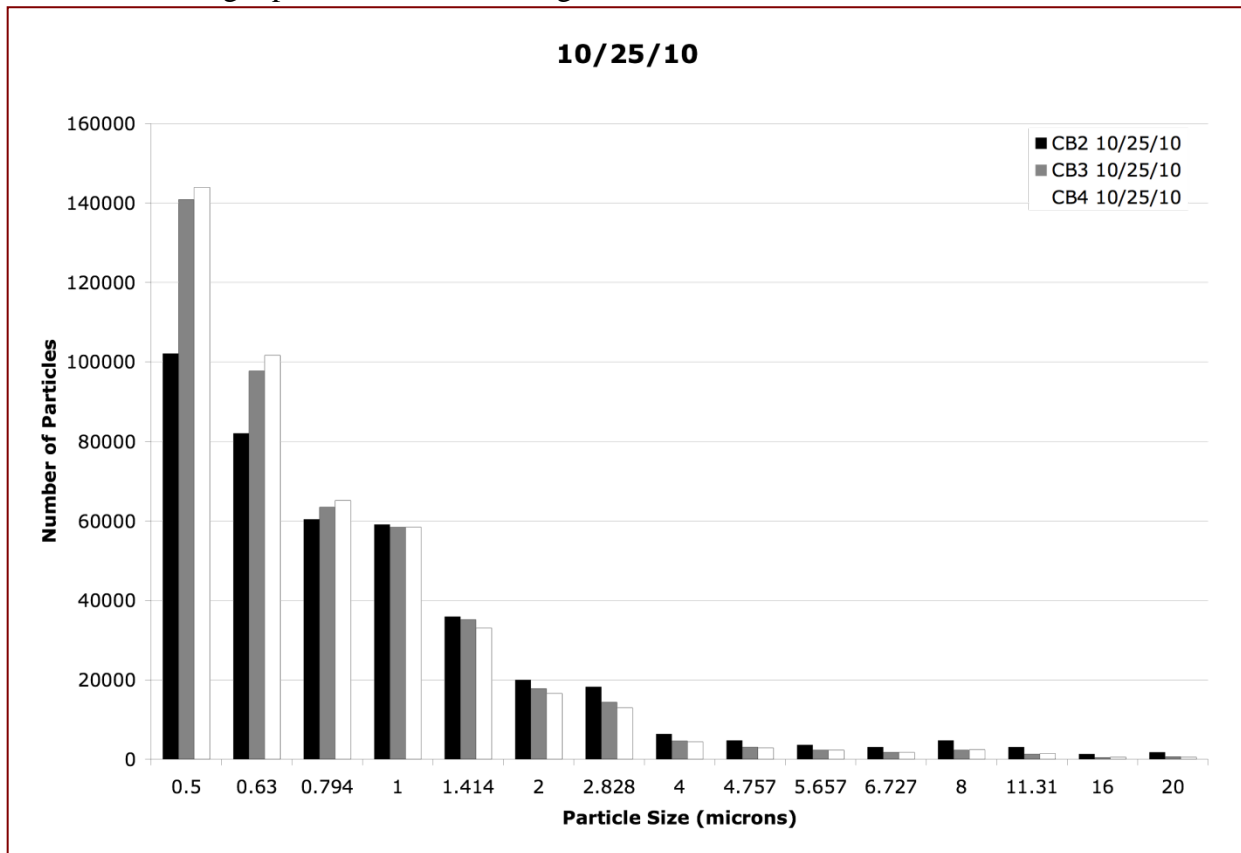


¹ This document is an intermediate progress report, not a final report; consequently, any results should be considered preliminary and should not be cited. Please contact the principal investigators or the Tahoe SNPLMA Science Program Coordinator if you have questions.

pH: The pH is all below 7 and is decreasing across the floodplain.



Particle Size Distribution: Fine particles seem to be increasing through the basin and floodplain. Mid-sized and larger particles are decreasing.



Laboratory Biofilm Study Results

The capacity of biofilm to remove fine inorganic particles

Artificial storm water was applied to biofilm for 8 hours, 25 hours and 6 days to test the capacity of biofilm. Between 8 hours and 25 hours, biofilm remove more inorganic particles with the increase of exposure time to inorganic particles. At 6 days, the removed inorganic particles and the biofilm decreased. The artificial water was mixture of tap water and kaolin so there is not enough nutrients. The water condition is not desirable for biofilm to grow.

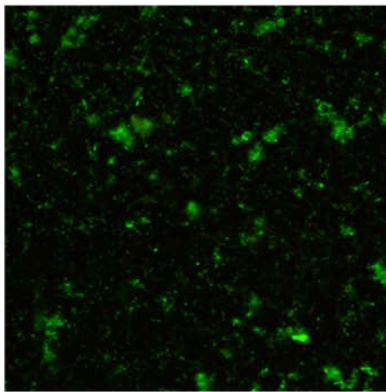
Table 1 The capacity of biofilm to remove fine inorganic particles

Clay contact time	TSS(mg/plate)	Inorganic(mg/plate)	Biofilm(mg/plate)	Capacity (mg inorganic/mg biofilm)
8 hours	65.53 ±(5.97)	42.18 ±(5.88)	23.34 ±(0.09)	1.77 ±(0.21)
25 hours	109.67 ±(49.82)	75.1 ±(41.1)	34.57 ±(8.73)	2.09 ±(0.66)
6 days	62.42 ±(29.47)	53.25 ±(25.79)	9.17 ±(3.68)	5.7 ±(0.52)

The affect of dehydration on particle removal

The green represents the total biovolume and the yellow represents the dead biovolume (Figure 1). After dehydration, cell die but it does not affect the biovolume (Figure 1, Table2). The thickness decreased from 66.6µm to 32 µm after dehydration which shows that the biofilm shrinks after dehydration. The roughness is indicator of the surface property of biofilm. The roughness did not change significantly after dehydration (Table 2). The inorganic particle removal capacity decreased after dehydration (Table 3) which is due to the decrease of biovolume. The small biovolume can supple less space for inorganic particles.

no dehydration



dehydration

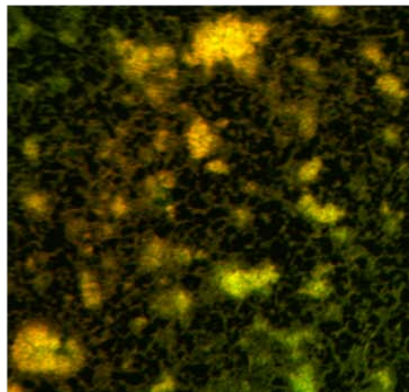


Figure 1 The comparison of biofilm before and after dehydration

Table 2 The architecture change of biofilm after dehydration

	Before dehydration	After dehydration
Roughness	0.55±(0.06)	0.49±(0.01)
Mean thickness (µm)	66.60±(14.29)	32.13±(2.8)
Biovolume(µm ³)	9.80×10 ⁵ ±(3.06×10 ⁵)	9.98×10 ⁵ ±(1.56×10 ⁵)

Table 3 The effect of dehydration on inorganic particle removal

	TSSmg/plate	inorganic mg/plate
dehydrated biofilm	39.83 ± (2.19)	11.35 ±(1.89)
biofilm	57.75 ±(5.03)	38.89 ±(1.35)

Project Photos:

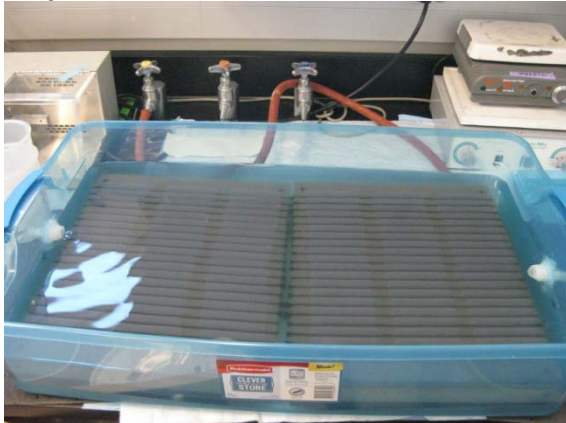


Photo 1: Laboratory biofilm pre-growth system.



Photo 2: Detention basin concrete overflow weir and flow measuring flume.



Photo 3: Job boxes housing auto samplers. Foreground: inlet at end of cul-de-sac, background: basin overflow weir.



Photo 4: Field installation of biofilm plates, shown with wood cover to keep snow off biofilm.