

2008 Benthic Flux Chamber Study Update

South River Science Team
October 21, 2008

Rich Landis, DuPont
JR Flanders, URS

Progress

- Developed method for deployment in gravel/cobble substrates
- Completed two BFC deployments to support the eco studies:
 - May: 4 FGCM deposits
 - August: 2 FGCM deposits, 4 embedded gravel areas
- Completed two BFC deployments to study the mass balance within a reach:
 - June: 3 FGCM deposits, 2 embedded gravel areas
 - Sept: 6 embedded gravel areas

May '08 BFC Eco Study



BFCs deployed in a flooded wetland feature in the oxbow at RRM 1.6

RRM 5.2
BFCs deployed Doom's
Dam mill race



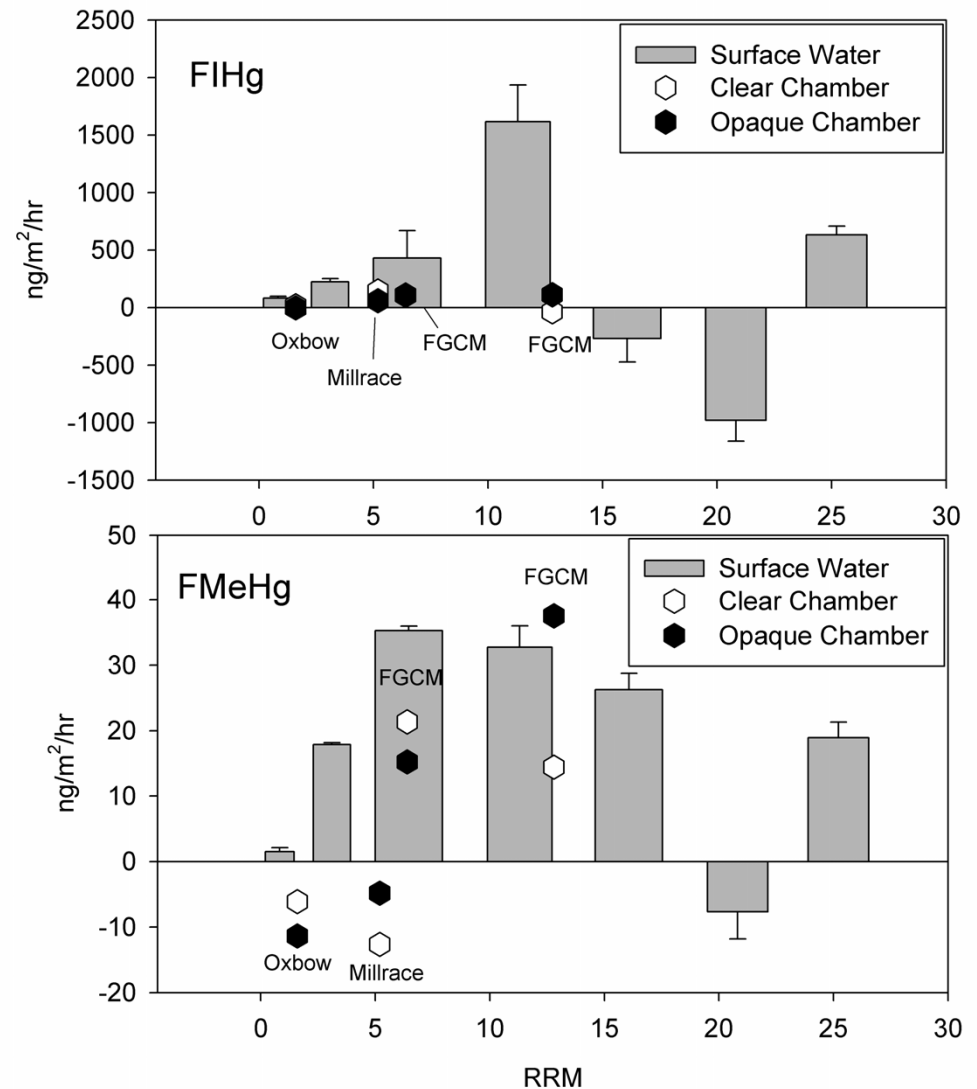
May '08 BFC Eco Study

Site Location	Habitat	Date	BFC Type	Flux		Sediment Data		
				(ng*m ⁻² *hr ⁻¹)		THg	MeHg	LOI
				FIHg	FMeHg	ug/g		%
RRM 1.6	FGCM Deposit	5/6/2008	Opaque	-4.29	-11.36	3.96	0.01	13.98
			Clear	17.21	-6.11			
RRM 5.2	FGCM Deposit	5/6/2008	Opaque	70.26	-4.81	45.15	0.06	6.46
			Clear	144.83	-12.64			
RRM 6.2	FGCM Deposit	5/7/2008	Opaque	106.69	15.23	18.90	0.11	23.23
			Clear	112.00	21.34			
RRM 12.8	FGCM Deposit	5/8/2008	Opaque	112.60	37.55	45.20	0.20	12.94
			Clear	-36.26	14.44			

- Wetland habitat at RRM 1.6 and mill race habitat at RRM 5.2 appear to be sinks for FMeHg
- FMeHg fluxes for FGCM deposits at 6.2 and 12.8 are within range of previous data.
- FIHg fluxes are within the range of previous data

May '08 BFC & SW Data

- FIHg and FMeHg fluxes from FGCM deposits uniformly low compared to SW
- FGCM deposits may not be significant source of FIHg or FMeHg to SW due to their limited areal extent
- The range of DO measured in BFCs were similar to the long term 24 hr surface water DO.



June '08 Reach Study Design

- Deployed BFCs at six locations between RRM 2.3 and RRM 5.0
- Collected SW samples at bridges (HP and Dooms') in AM and PM to determine reach wide flux

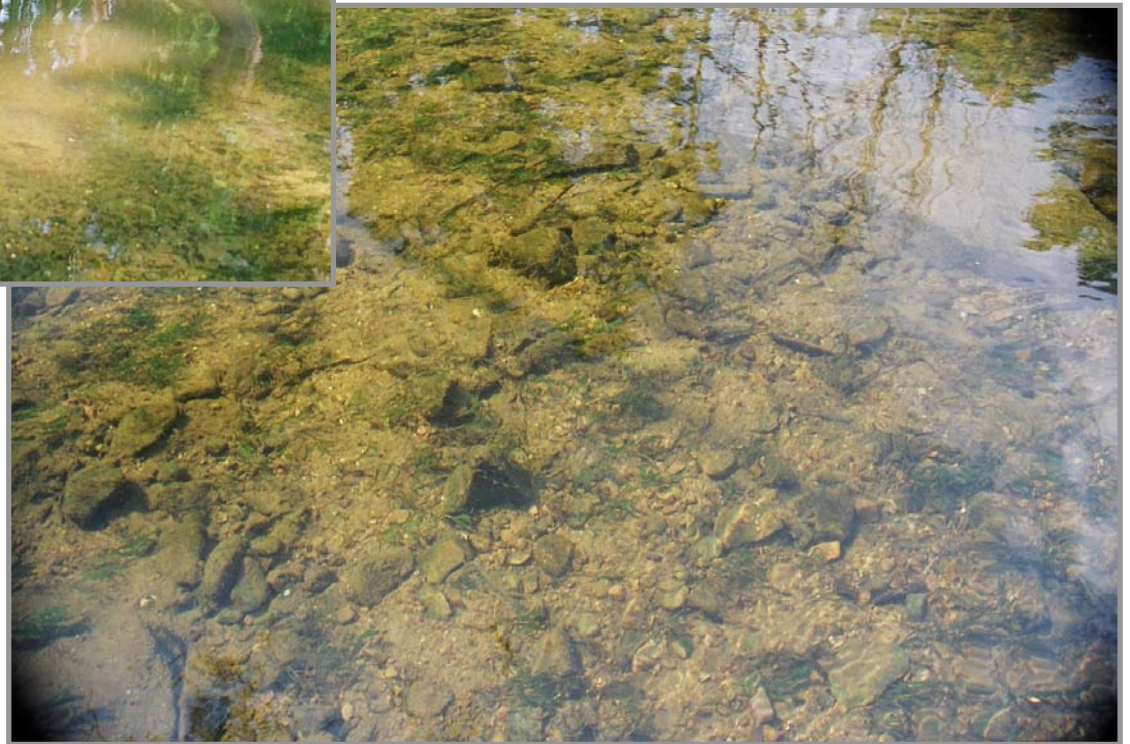


June '08 BFC Reach Study



Typical example of embedded gravel streambed in the majority river - RRM 4.0

RRM 4.0
FGCM deposit near the
Shifflet farm



June '08 BFC Reach Study

Site Location	Habitat	Date	Whole River Flux (ng/hr/m ²)				BFC Type	Flux		Sediment Data			
			FIHg		FMeHg			(ng/hr/m ²)		THg	MeHg	Fines	LOI
			AM	PM	AM	PM		FIHg	FMeHg	ug/g		%	
RRM 2.8	FGCM Deposit	6/17/2008	490	651	53	61	Opaque	-16.6	29.5	18	0.03	38	3.1
	Clear						10.4	26.4					
RRM 4.0	FGCM Deposit	6/18/2008	456	618	36	33	Opaque	-45.4	117.3	24	0.09	56	2.5
	Clear						-39.4	163.9					
RRM 4.6	FGCM Deposit	6/18/2008	456	618	36	33	Opaque	-44.4	30.1	21	0.06	41	3.5
	Clear						16.7	40.4					
RRM 4.0	Rock Plate	6/19/2008	498	661	31	40	Opaque	-42.5	11.1	56	0.12	--	1.4
	Clear						-35.8	2.1					
RRM 4.0	Embedded Gravel	6/19/2008	498	661	31	40	Opaque	28.3	3.7	69	0.07	--	1.1
	Clear						56.2	6.7					
RRM 4.6	Embedded Gravel	6/19/2008	498	661	31	40	Opaque	43.5	8.4	38	0.04	--	1.6
	Clear						107.0	5.9					

- FMeHg Flux rates measured from FGCM deposit at RRM 4.0 are elevated, but do not appear to be a significant source due to its limited areal extent of FGCM deposit.
- FMeHg Flux rates measured from the embedded gravel at RRM 4.6 suggests that it could be an important source to surface water due to its much greater areal extent.
- Flux of FIHg from the embedded gravel streambed is still somewhat of a mystery?

Aug '08 BFC Eco Study



Embedded gravel streambed
at RRM 6.2

FGCM deposit
at RRM 6.2



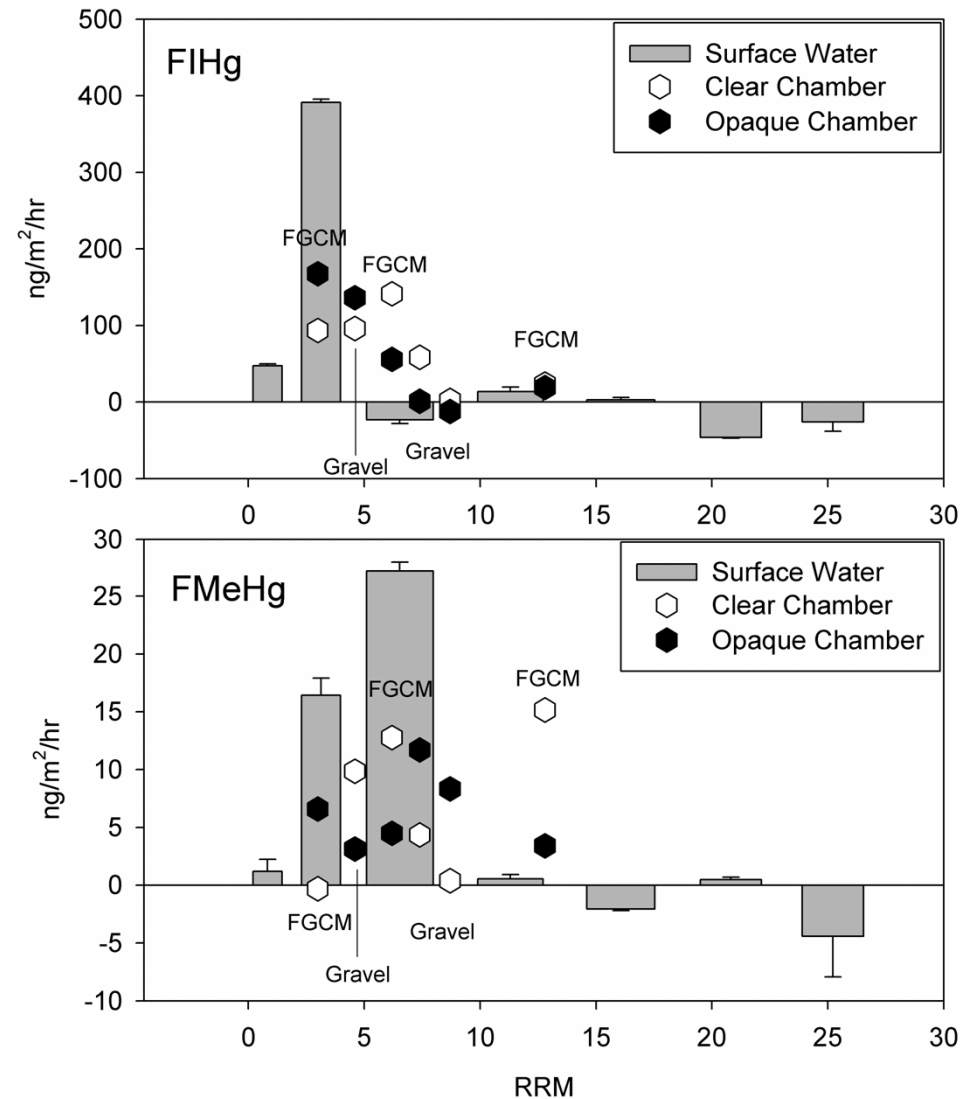
Aug '08 BFC Eco Study

Site Location	Habitat	Date	BFC Type	Flux		Sediment Data			
				(ng*m ⁻² *hr ⁻¹)		THg	MeHg	%Fines	LOI
				FIHg	FMeHg	ug/g		%	
RRM 3.0	FGCM Deposit	8/19/2008	Opaque	144.65	5.18				
			Clear	84.89	-0.64				
RRM 4.6	Embedded Gravel	8/20/2008	Opaque	124.78	1.24				
			Clear	222.27	7.45				
RRM 6.2	FGCM Deposit	8/19/2008	Opaque	51.28	1.33				
			Clear	97.66	11.42				
RRM 7.4	Embedded Gravel	8/21/2008	Opaque	-31.13	9.32				
			Clear	50.90	4.29				
RRM 8.7	Embedded Gravel	8/20/2008	Opaque	-27.27	4.16				
			Clear	-3.42	-1.71				
RRM 12.8	FGCM Deposit	8/21/2008	Opaque	12.89	2.90				
			Clear	9.54	13.90				

Note: Sediment data is pending analysis

Aug '08 BFC Eco Study

- FIHg and FMeHg fluxes from FGCM deposits were low or similar compared to SW
- As in May, FGCM deposits may not be significant source of FIHg or FMeHg to SW due to their limited areal extent
- The embedded gravel streambed may be a significant source of FMeHg to SW due to its much greater areal extent.



Going Forward

- Complete analysis of Aug. and Sept. 2008 BFC samples and data
- Complete tests using pressure transducers to determine if advective flow is significantly influenced by BFCs in embedded gravel deployments
- Conduct BFC enhanced stirring tests to potentially better account for more FIHg and FMeHg for embedded gravel deployments
- Potentially develop thinner BFC to study areas closer to the banks
- Focus BFC deployments in 2009 on embedded gravel
- Continue to strive for reach habitat mass balance of FIHg and FMeHg