2007 Passive Sampler Results in Context

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Fish Kill Task Force

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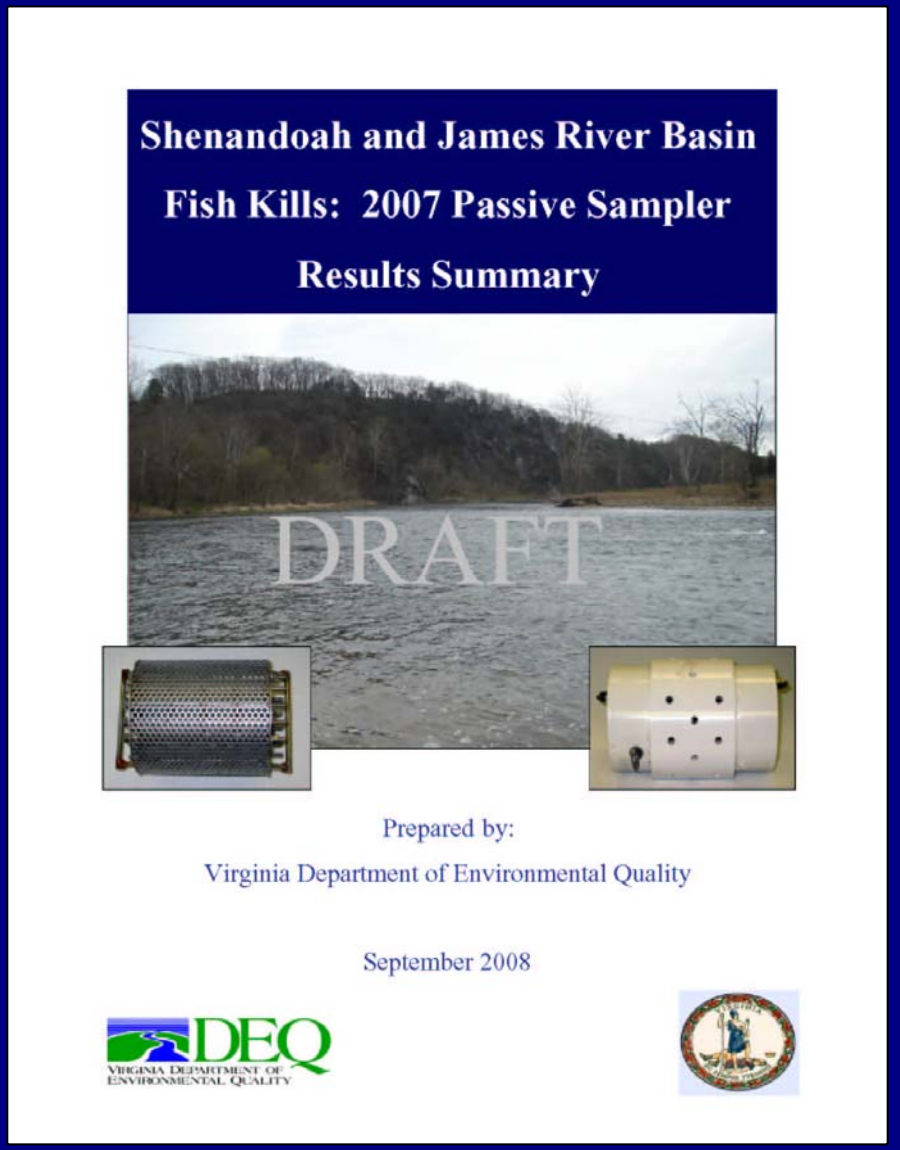

Passive Sampler Deployment

River	Location	Deployment Date		Duration (d)	Replicates
		From	To		
Shenandoah	Berryville	3/28/2007	5/9/2007	42	1
NF Shenandoah	Cootes Store	3/22/2007	5/3/2007	42	1
	Mt. Jackson	3/10/2007	4/29/2007	50	2
		4/29/2007	6/9/2007	41	2
	Woodstock	3/10/2007	4/29/2007	50	2
		4/29/2007	6/9/2007	41	2
	Strasburg	3/22/2007	5/3/2007	42	1
Linville Creek	Broadway WWTP	3/22/2007	5/3/2007	42	1
SF Shenandoah	White House	3/23/2007	5/4/2007	42	1
North River	Port Republic	3/22/2007	5/3/2007	42	1
South River	Harriston	3/22/2007	5/3/2007	42	1
Cowpasture River	Walton Tract	3/23/2007	5/4/2007	42	1
Maury River	at Mill Creek	3/23/2007	5/4/2007	42	1
Cedar Creek	Stalnaker Property	3/22/2007	5/3/2007	42	1
Total =	**12 sites**				

DEQ

Parameters

Class of Compounds	# of Parameters	Sampler Type	Units
PAHs	34	SPMD	pg/L
Organochlorine Pesticides and PCBs	34	SPMD	pg/L
Agricultural Herbicides and Pesticides	35	POCIS	ng/L
Waste-indicator Chemicals	61	POCIS	ng/POCIS
Pharmaceuticals	30	POCIS	ng/POCIS
Hormones	4	POCIS	ng/L
Estrogenic Potential	1	POCIS	ng E2/POCIS
Total =	**199 Parameters**		

Approach

- Compare measured values to:
  - Virginia Water Quality Standards –
    - Freshwater chronic criterion
  - Control Sites –
    - Cedar Creek and Maury River
  - Published Effect Level Data –
    - EPA's ECOTOX database of ecotoxicology literature
    - Focus on Micropterus and Lepomis genera, then expanded to all fish
    - Focus on lowest reported concentration for mortality effects

Approach (cont.)

- Compare measured values to:
  - Surface Water Benchmark Screening Criteria –
    - From Oak Ridge National Lab's Risk Assessment Information System Database
    - Database of published US and Canadian screening criteria
    - Focus on lowest reported screening criterion
  - Virginia Probabilistic Monitoring Data –
    - From state-wide SPMD monitoring in 2003
    - Focus on 90% percentile state-wide results

Control Site Comparison

#Parameters >control at:	PAHs	OC Pest.	Ag. Pest.	Waste Ind.	Pharm.	Hor-mones	Total
1 or more sites	20	28	11	17	3	5	84
more than 3 sites	0	7	5	4	1	0	17
more than 5 sites	0	2	4	0	0	0	6
all sites	0	0	0	0	0	0	0

- Parameters > control at a majority of sites:
  - chlorpyrifos
  - p,p'-methoxychlor
  - metolachlor
  - atrazine
  - simazine
  - prometon

Probabilistic Monitoring Comparison

#Parameters >90th % at:	PAHs	OC Pest.	Total
1 or more sites	4	10	14
more than 3 sites	0	3	3
more than 5 sites	0	2	2
all sites	0	0	0

- Parameters > 90th % at a majority of sites:
  - chlorpyrifos
  - p,p'-methoxychlor

Effect Level Data Comparison

Parameter Group	Ratio of Min. Effect Level to Max. Measured Value
PAHs	4400 - 2.1E+07
Organochlorine Pesticides	527 - 2.41E+10
Ag. Pesticides	10,300 - 1.39E+10
Waste-Indicator	NA
Pharmaceuticals	NA
Hormones	12.3 - 500

- No compound at any site exceeded minimum published lethal effect levels

Benchmark Screening Comparison

Parameter Group	Ratio of Min. Screening Criteria to Max. Measured Value
PAHs	14.3 - 58,800
Organochlorine Pesticides	6.36 - 1.57E+6
Ag. Pesticides	2.77 - 417
Waste-Indicator	NA
Pharmaceuticals	NA
Hormones	NA

- No compound at any site exceeded minimum published benchmark screening criteria
- Compounds within an order of magnitude: atrazine, chlorpyrifos, hexachlorobenzene

Conclusions

- Passive sampler data produced no evidence that fish kills are a direct result of chemical contamination in the water column
- Of course, water quality causes cannot be completely ruled out because:
  - Not all chemicals tested
  - Effect level data not available or relevant for all chemicals
  - Mixture effects and sublethal effects not completely considered
- But, data to date do not point in the direction of a water quality cause

Cowpasture River Conundrum

- Spread of fish kills to the Cowpasture creates a real problem for any fish kill theory that's based on a water quality cause
- Passive sampler data and routine water chemistry show very "clean" conditions in Cowpasture
- Of 199 parameters tested, only 21 even detected in Cowpasture (compared to 55 at control sites)
- Only 3 exceeded control values:
  - caffeine (not toxic at environmentally relevant conc.)
  - pendimethalin (5 orders of magnitude below minimum effect levels)
  - 4-methylbiphenyl (3 orders of magnitude below minimum effect levels
- In order for a water quality cause of the fish kills, Cowpasture River data suggest that the culprit would have to be some parameter not yet measured and not correlated with the groups of contaminants that have been measured