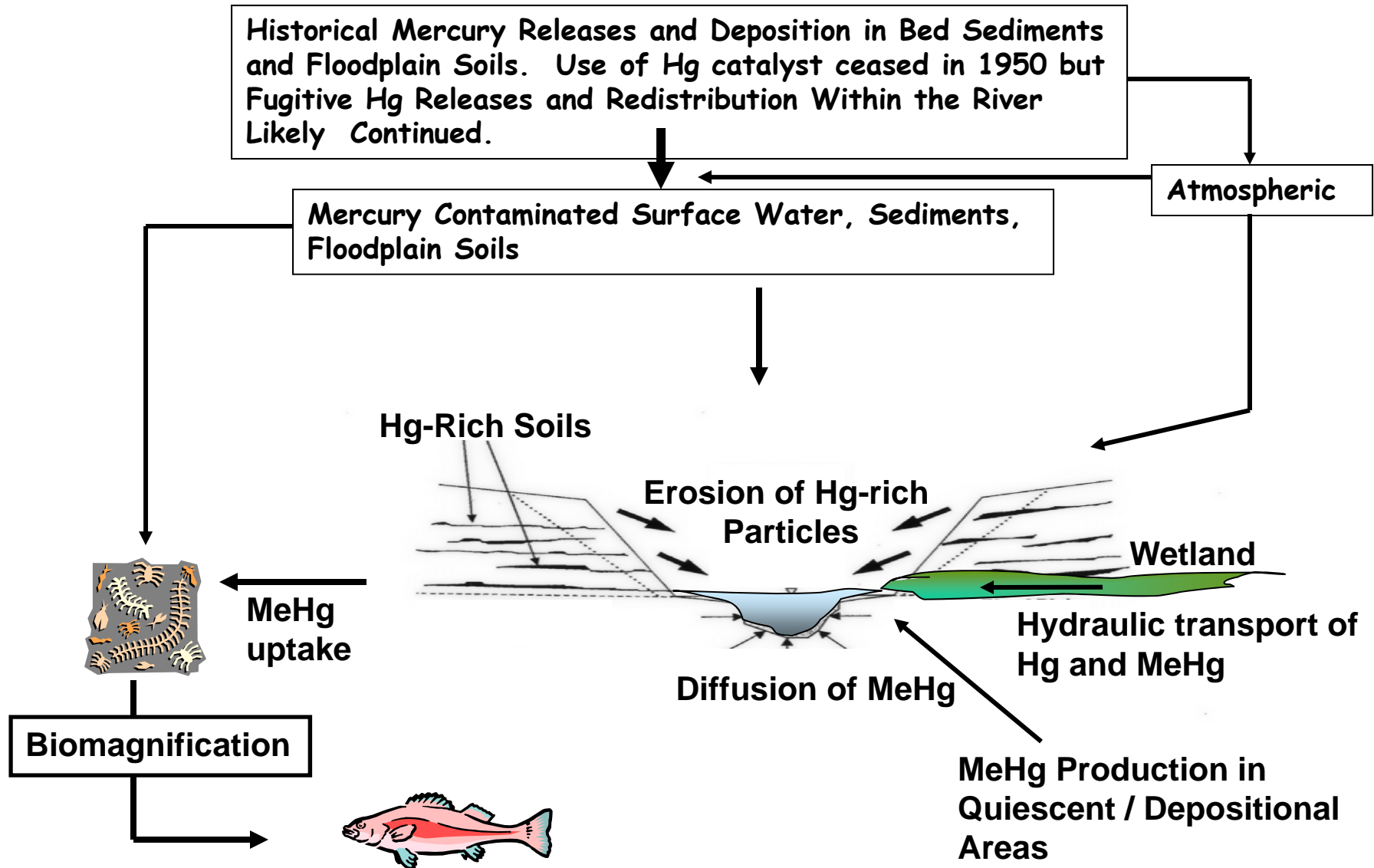


What We Know or What We Think We Know



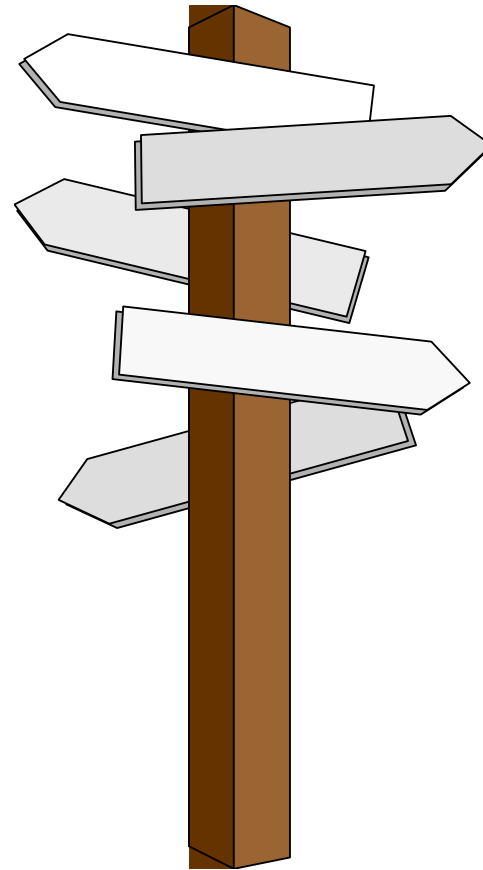
Expert Panel Meeting
October 11-12, 2006

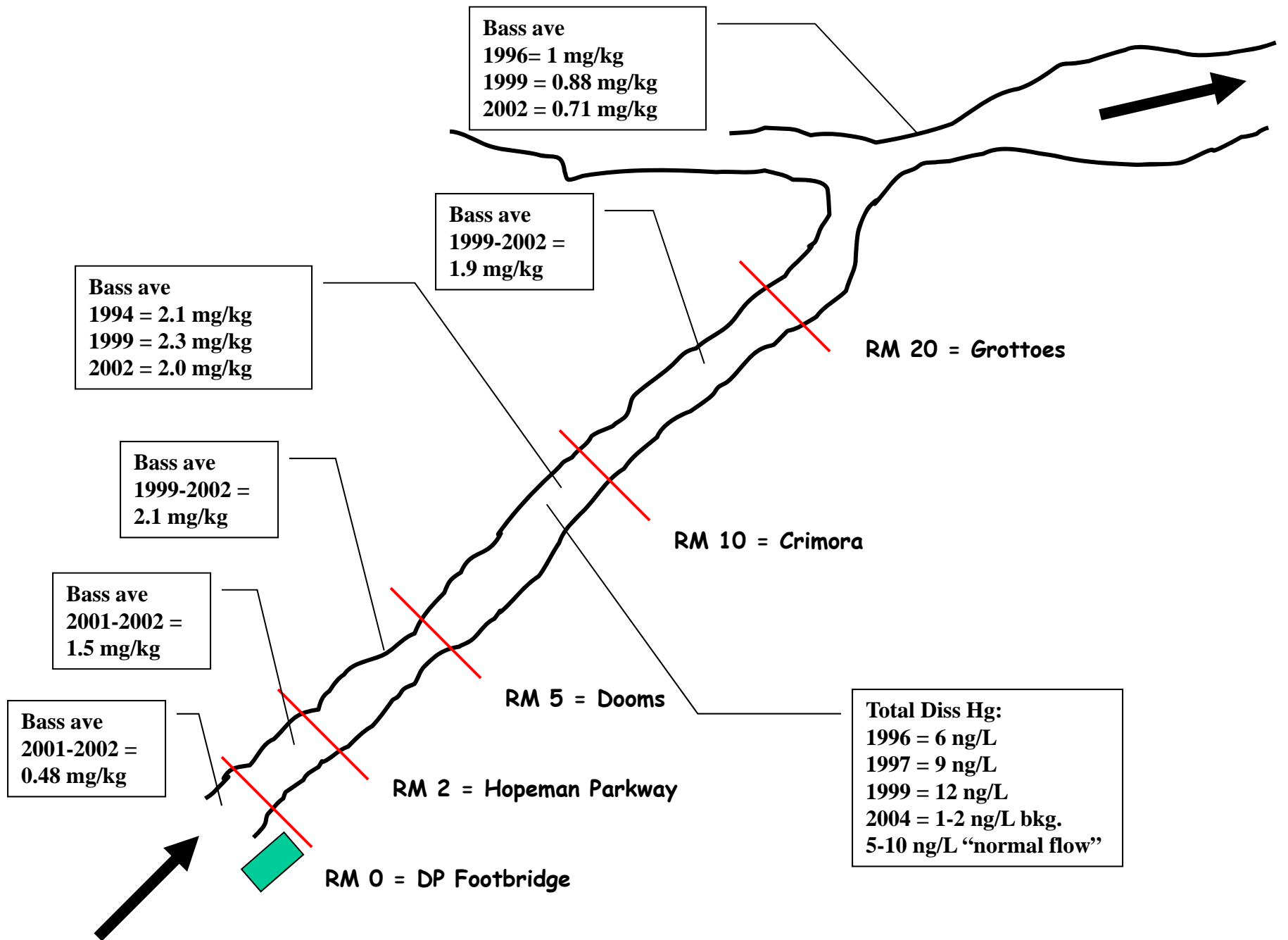
Conceptual System Model of Historical Mercury Contamination and Current Exposure Pathway To Fish in the South River, Virginia.



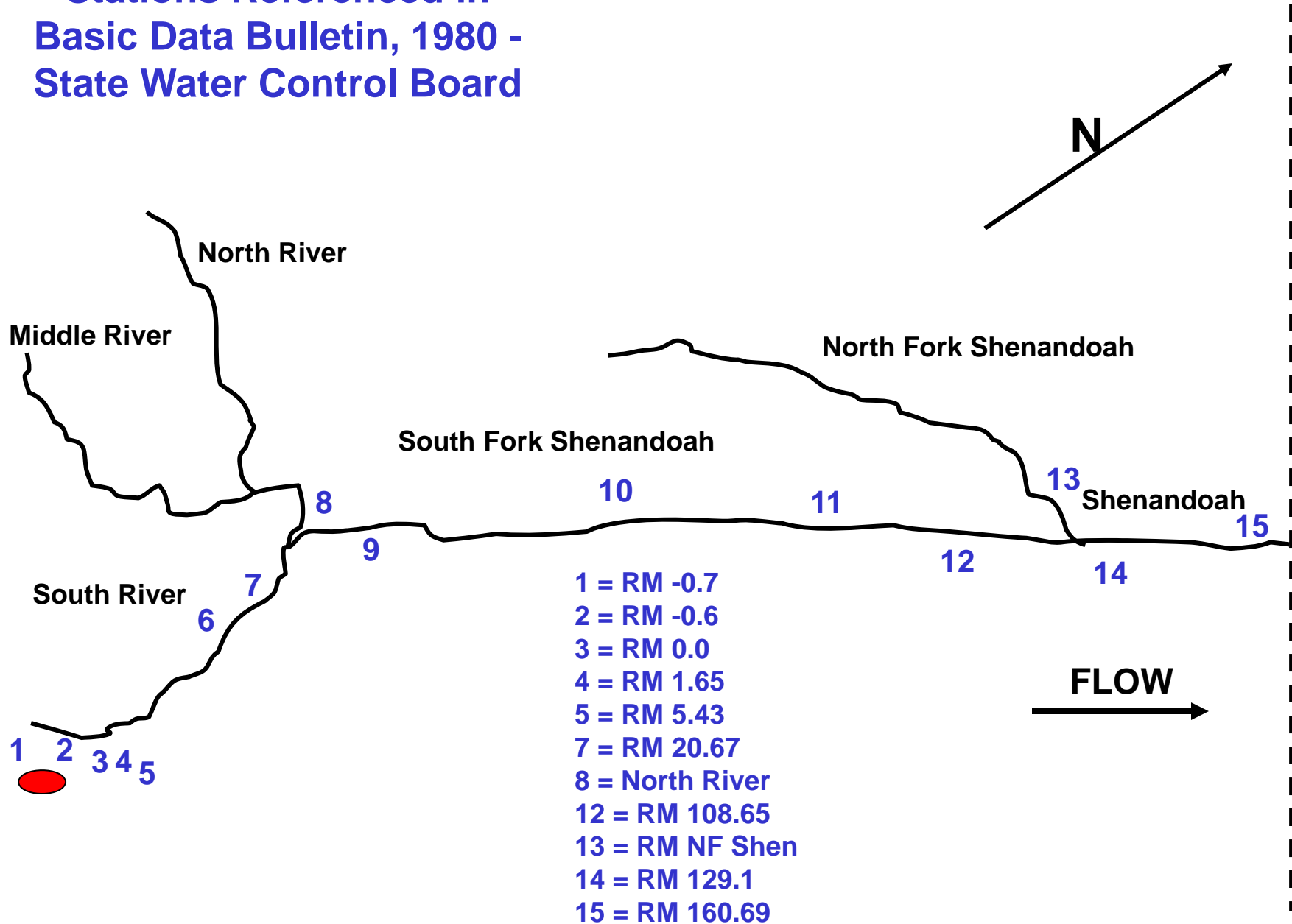
A Trip Down Memory Lane

- Follow the Yellow Brick Road !





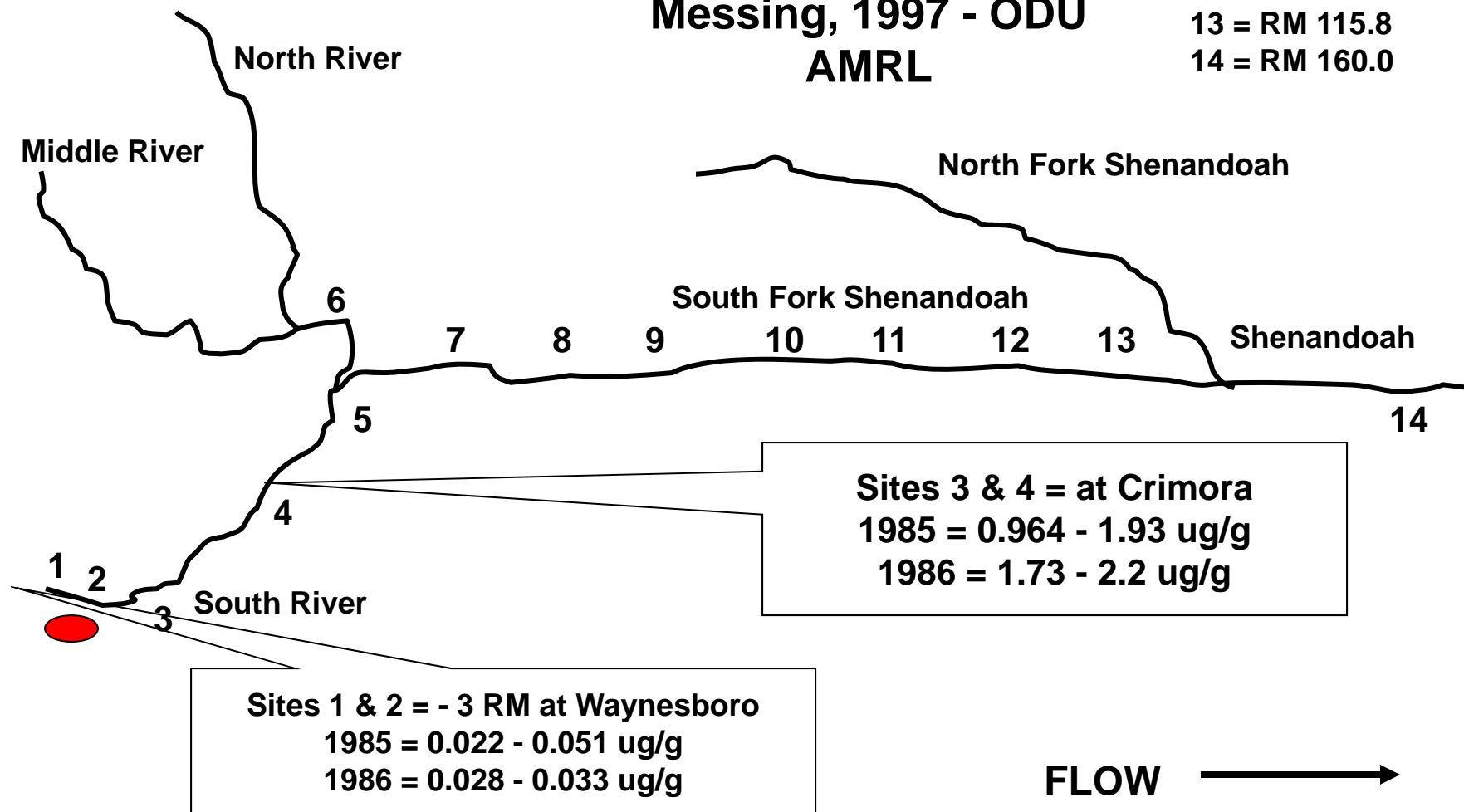
Stations Referenced in Basic Data Bulletin, 1980 - State Water Control Board



Periphyton Study 1985-86 on Artificial Substrates

- 1 = RM -0.7
- 2 = RM 0.0
- 3 = RM 5.4
- 4 = RM 10.5
- 5 = RM 20.7
- 7 = RM 27.9
- 8 = RM 49.7
- 12 = RM 108.7
- 13 = RM 115.8
- 14 = RM 160.0

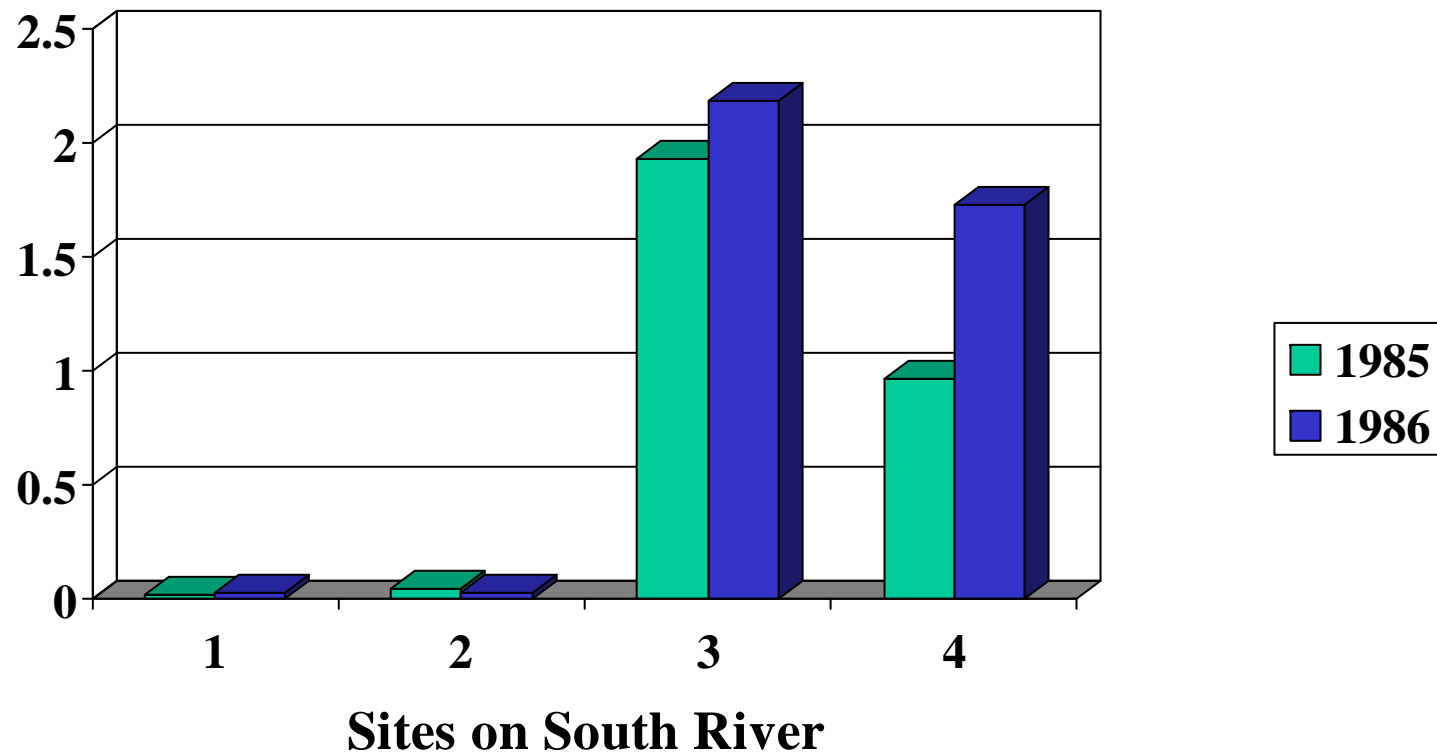
**Stations Referenced in
Messing, 1997 - ODU
AMRL**



Average Total Hg (ug/g) in Periphyton South River from Hendricks et al. 1989 - Artificial Substrates

Date	Site 1	Site 2	Site 3	Site 4
6-12/85	0.022	0.051	1.927	0.964
1-12/86	0.033	0.028	2.182	1.725
Mean	0.031	0.038	2.359	1.765

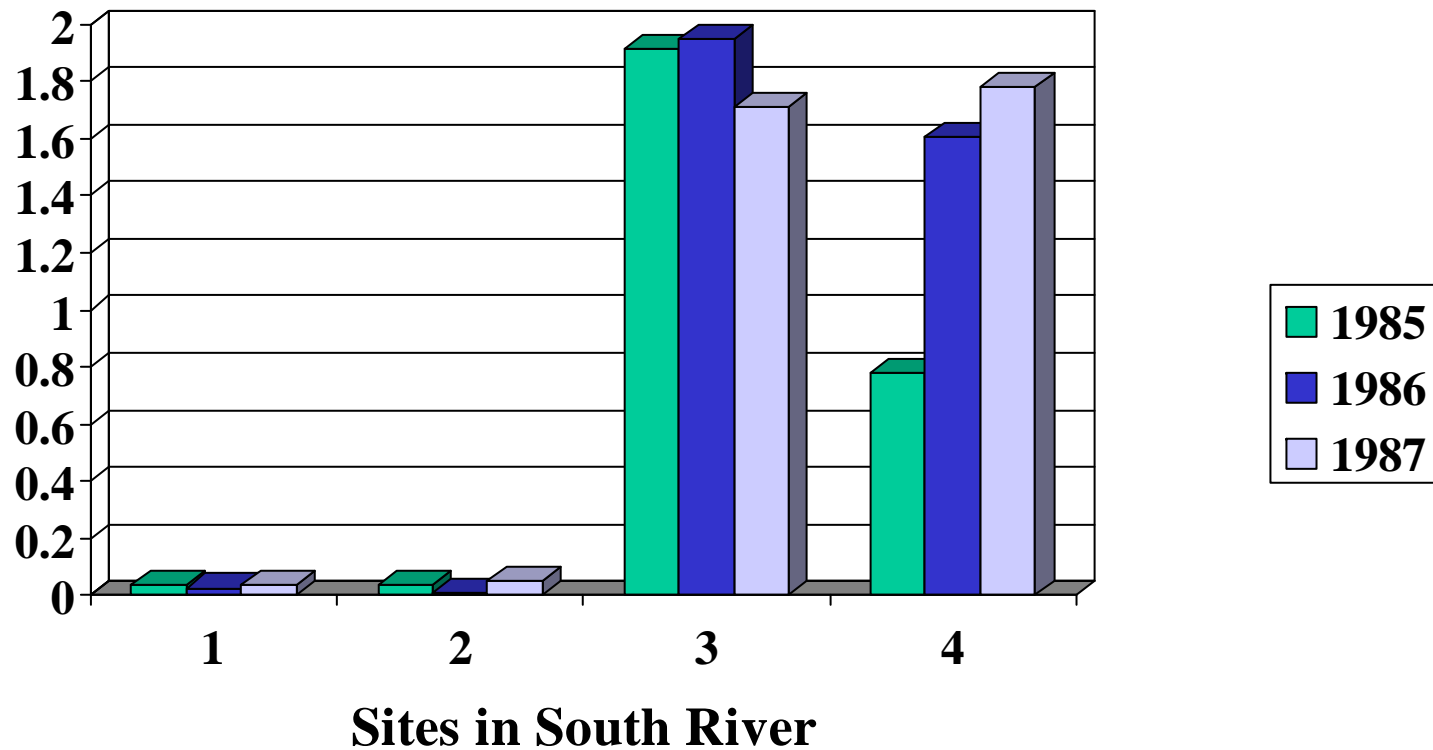
Average Total Hg (ug/g) in Periphyton 1985-86 from Artificial Substrates



Average Total Hg (ug/g) in Periphyton South River from Hendricks et al. 1989 - Natural Substrates

Date	Site 1	Site 2	Site 3	Site 4
4-12/85	0.04	0.04	1.91	0.78
1-12/86	0.028	0.008	1.946	1.605
5-7/87	0.04	0.05	1.71	1.78
Mean	0.034	0.023	1.941	1.58

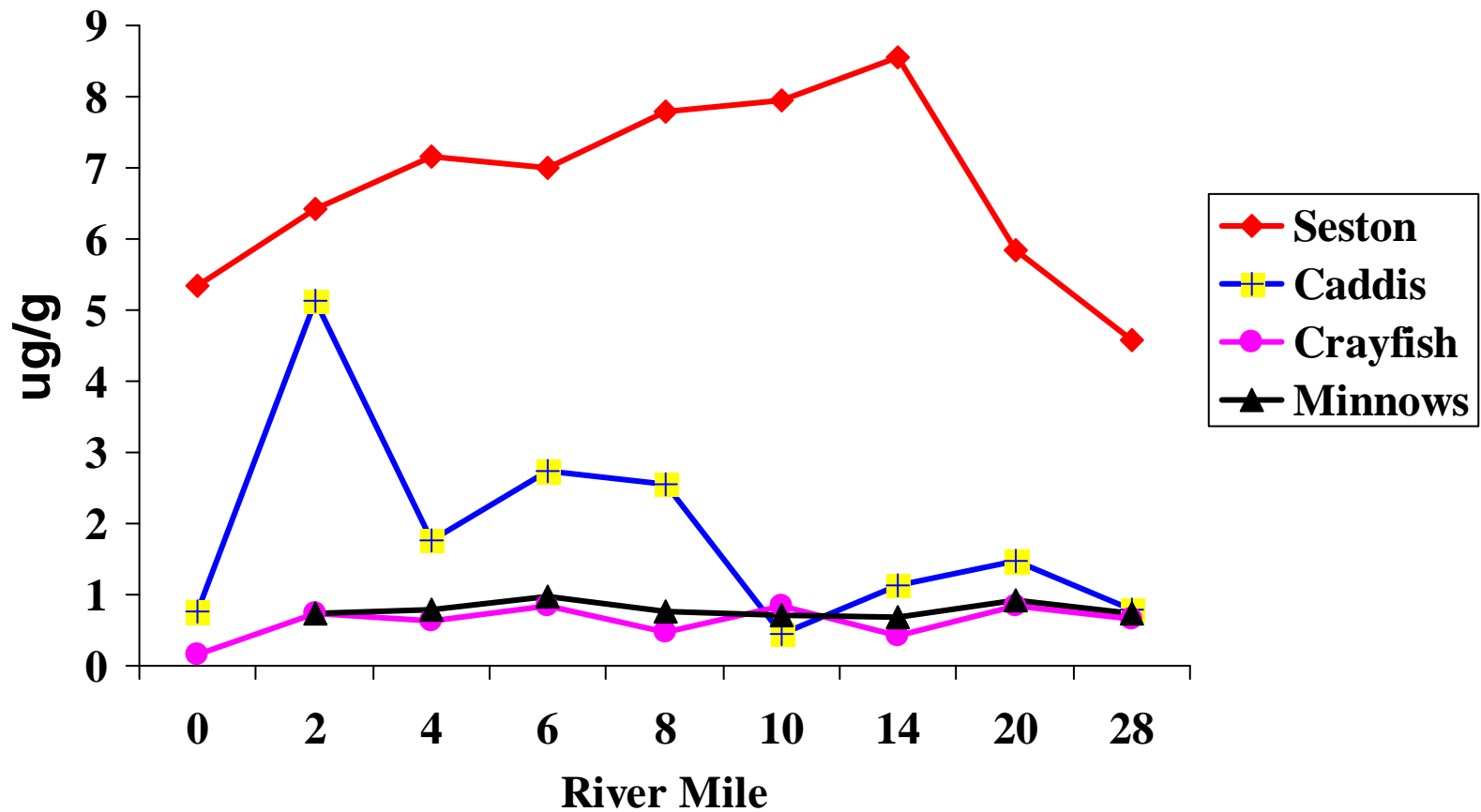
Average Total Hg (ug/g) in Periphyton 1985-87 from Natural Substrates



Average Total Hg (ug/g) in Seston and Organisms, 1986.

River Mile	Seston	Caddis	Crayfish	Minnows
0	5.34	0.76	0.17	N/a
2	6.43	5.12	0.75	0.75
4	7.17	1.77	0.64	0.80
6	7.01	2.75	0.85	0.97
8	7.8	2.56	0.47	0.76
10	7.95	0.46	0.83	0.70
14	8.54	1.12	0.42	0.68

Average Total Hg in Seston and Organisms, 1986.



And What of 2006 ?

Geomorphology

- Jim Pizzuto
 - Bank erosion occurring, rates vary but are low
 - Base flow, localized deposition from active bank
 - Flood events - move large volumes of sediment, but contribute little to deposition

Trends, Sources, Mechanisms

- Turner & Jensen
 - No clear evidence of point source input of mercury to water column
 - Some evidence of elevated mercury levels near bank compared to thalweg
 - Hyporeic zone may play a role in contributing to water column, more data needed
 - Limited information on the role of alluvial groundwater

SW and Sediment

- JR Flanders
 - Slight elevation in water column mercury during April compared to other months - holds for total and MeHg
 - Some evidence of difference in particulate Hg, and Hg on particulates with river location
 - Two high water events sampled, too soon to draw conclusions on their potential role in increasing or decreasing Hg bioavailability

TMDL

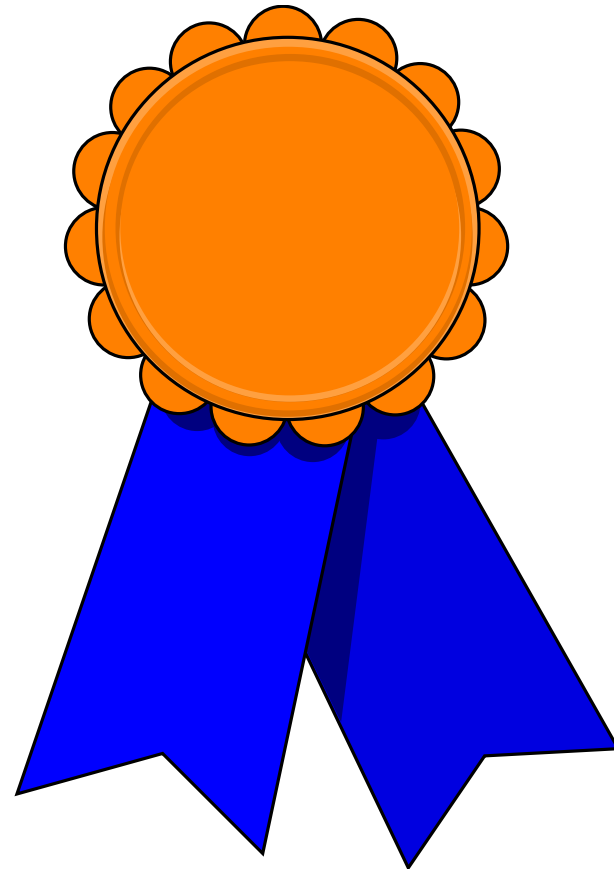
- Jack Eggelston / Robert Brent
 - Highest and lowest Hg on suspended solids at base flow, not during storm events.
 - Filtered total Hg tends to increase with increasing flows
 - Tentative TMDL of 5 ng/L total Hg

Statistical *zzzzzzzzzzzzzzzzzz* !

- John Green
 - Some evidence of statistical correlation between flood events and levels of total Hg in SMB, Sucker, RBS, but not in LMB
 - LMB data limited
 - Trend is negative for current year, year 1 and 2
 - Trend is positive for year 3, post event

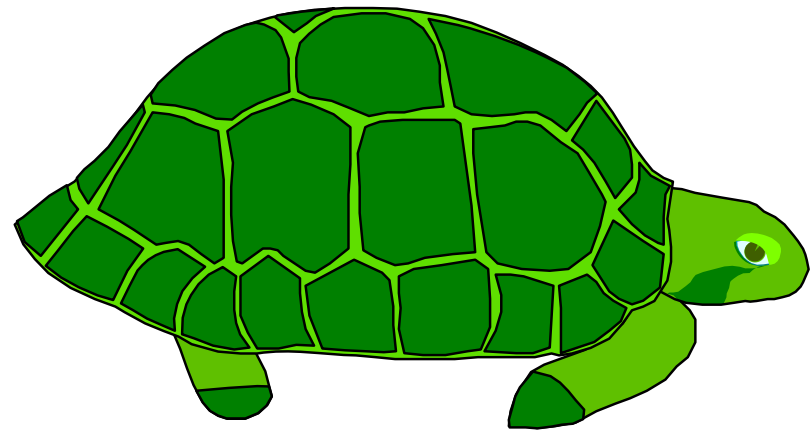
Where the Birds Are

- Everybody is carrying a share, some more than others.
- Limited information on effects to reproductive success.

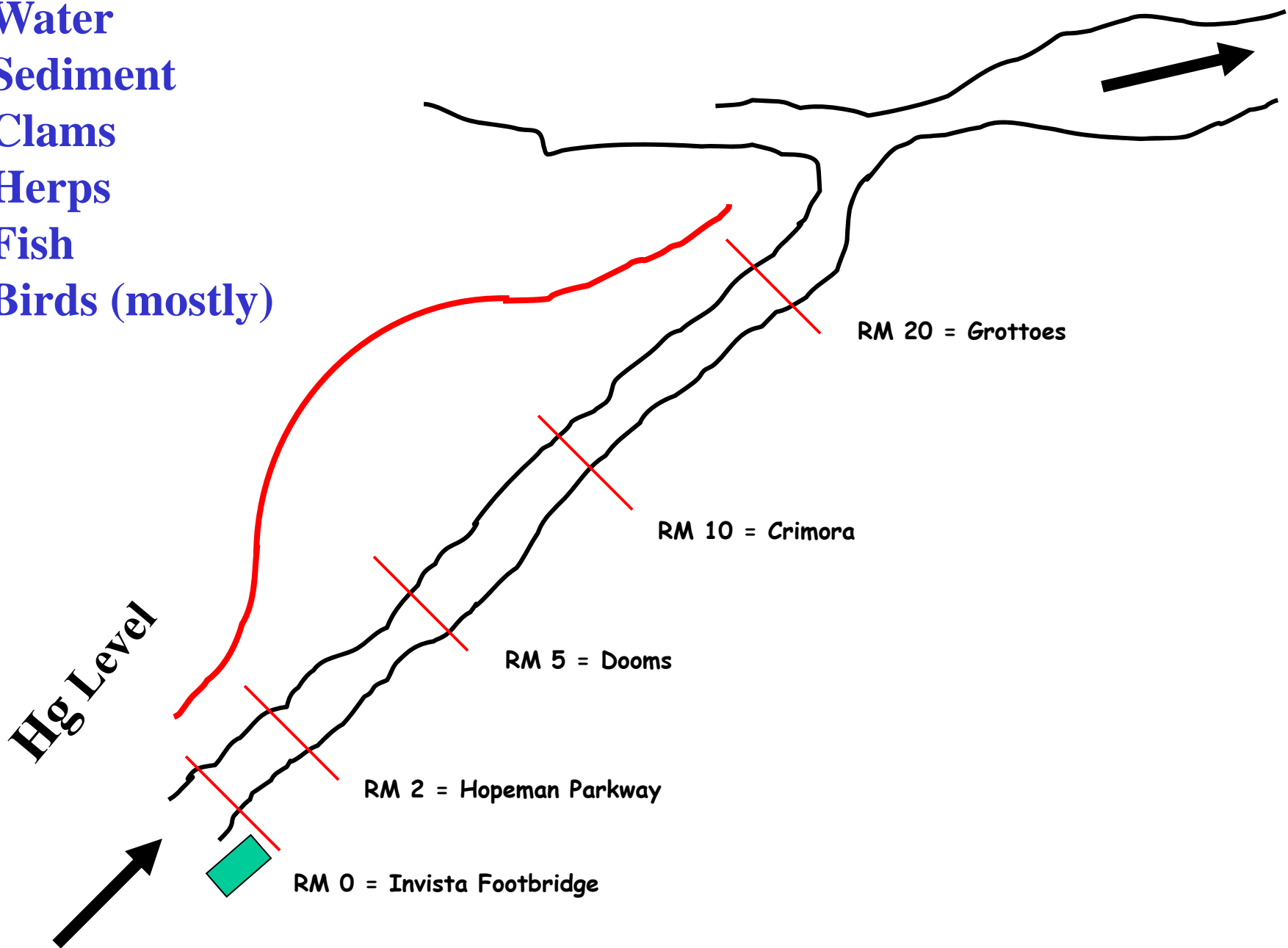


Not to be Left Out

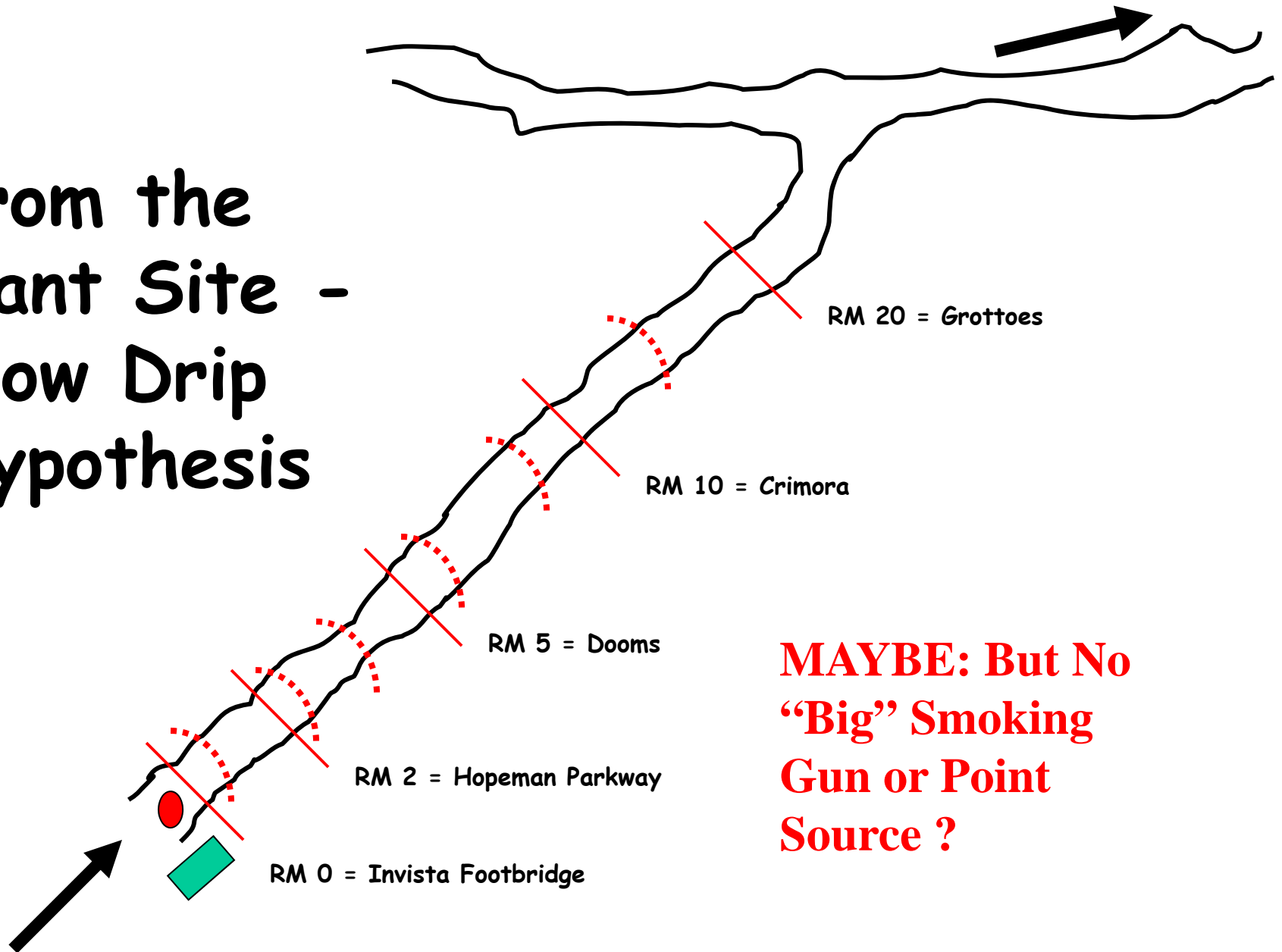
- Four species of turtles found in the watershed.
- Mercury detected, not restricted to “predator” turtle.
- The “hump” - what Hump Master ?



Water
Sediment
Clams
Herps
Fish
Birds (mostly)

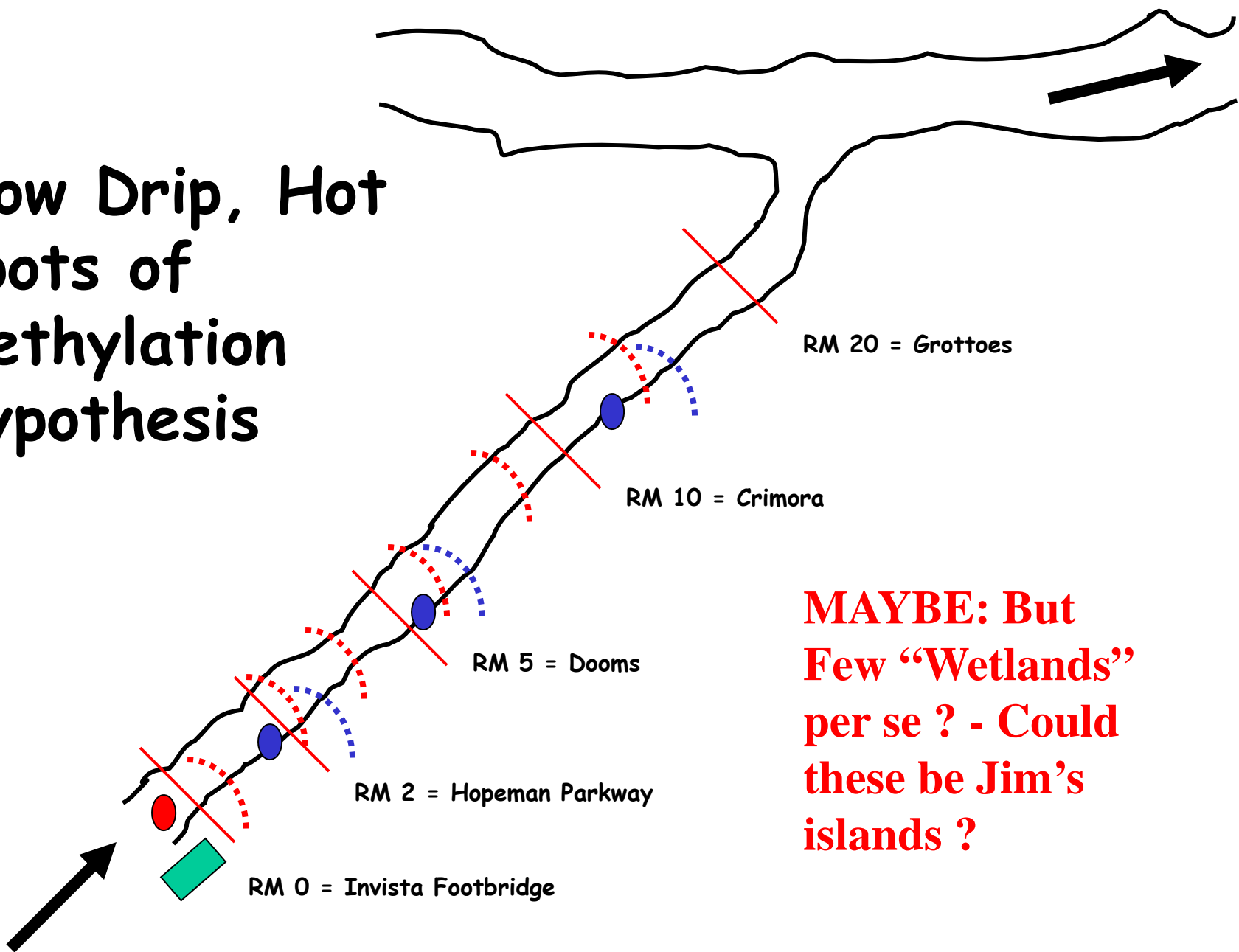


From the Plant Site - Slow Drip Hypothesis



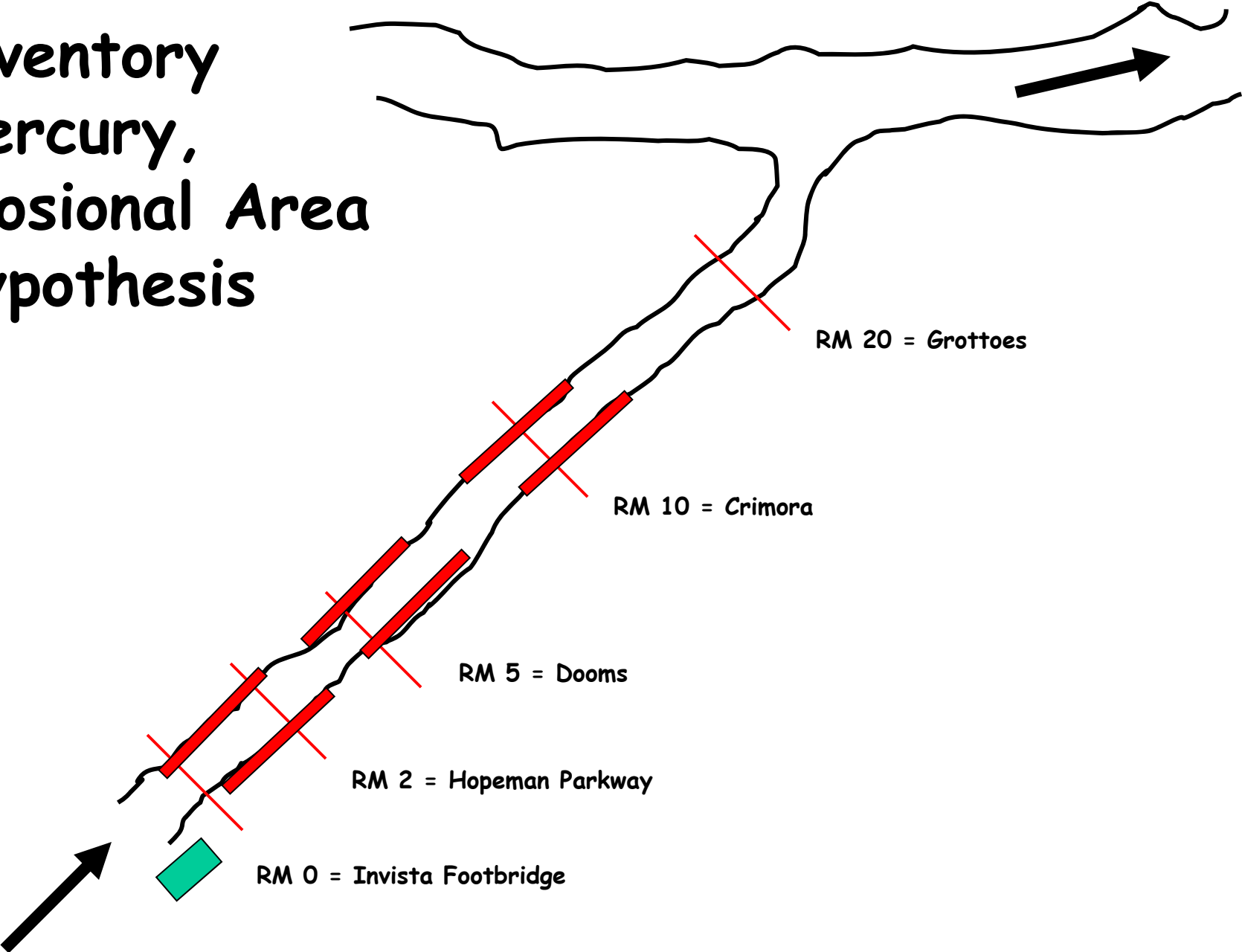
**MAYBE: But No
“Big” Smoking
Gun or Point
Source ?**

Slow Drip, Hot Spots of Methylation Hypothesis

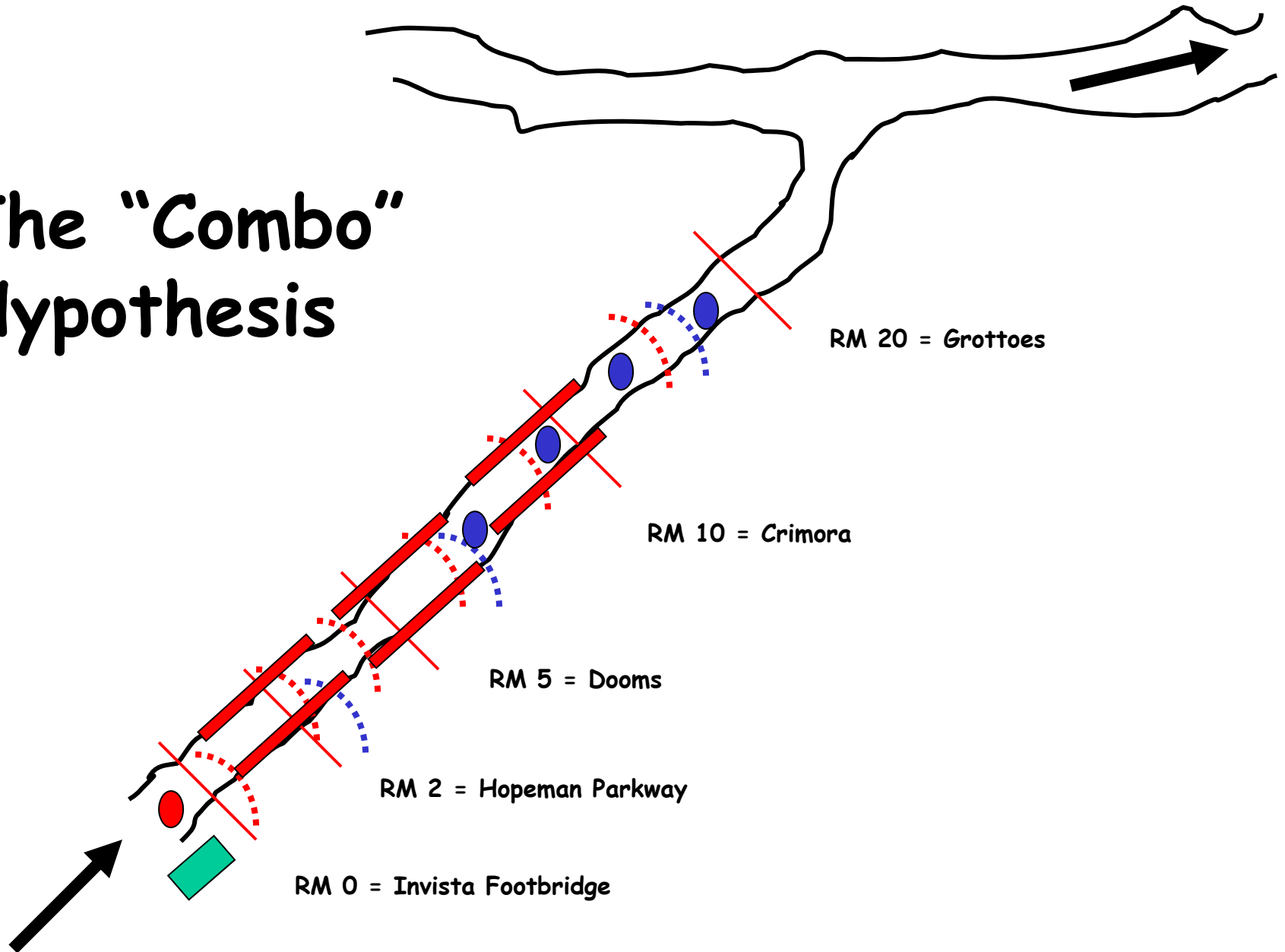


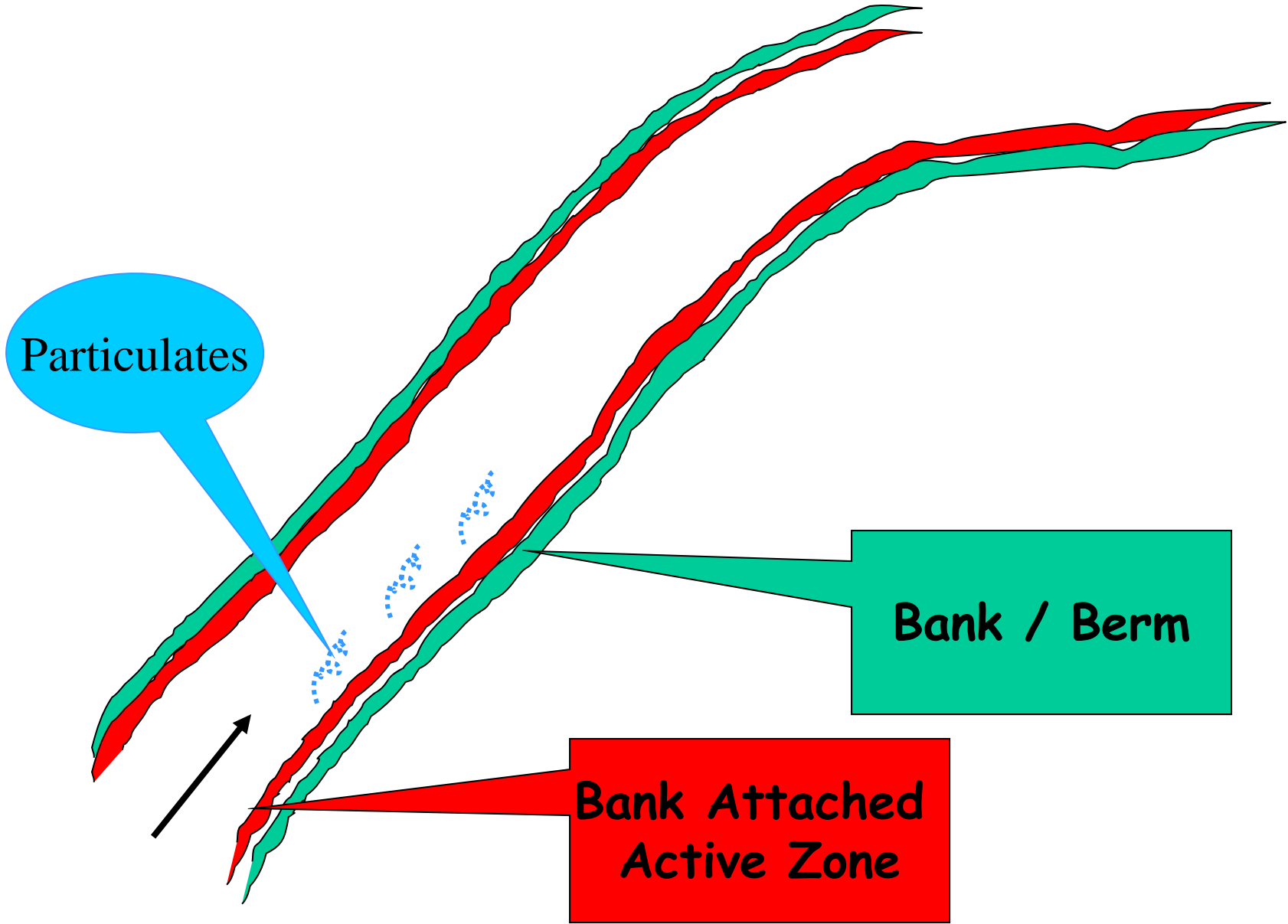
MAYBE: But Few “Wetlands” per se ? - Could these be Jim’s islands ?

Inventory Mercury, Erosional Area Hypothesis



The "Combo" Hypothesis



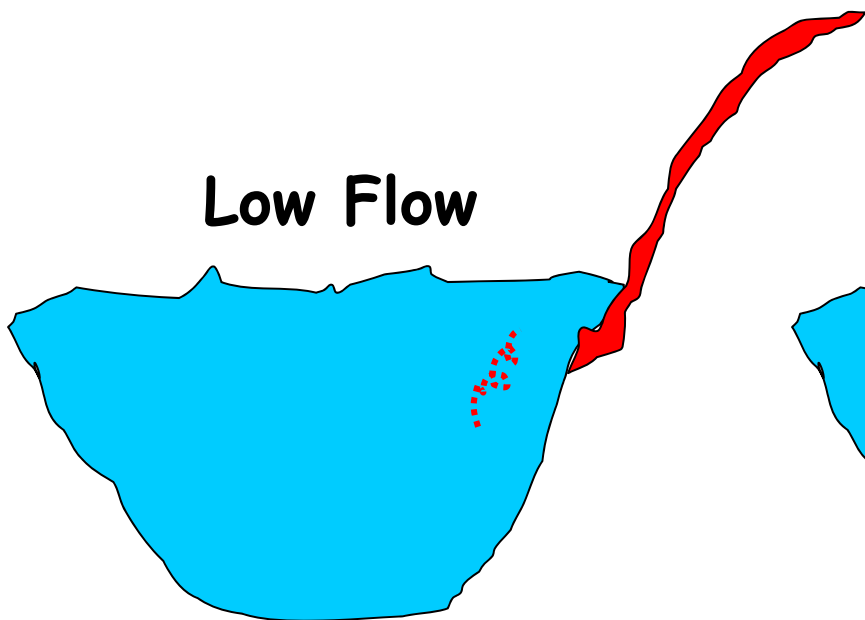


Particulates

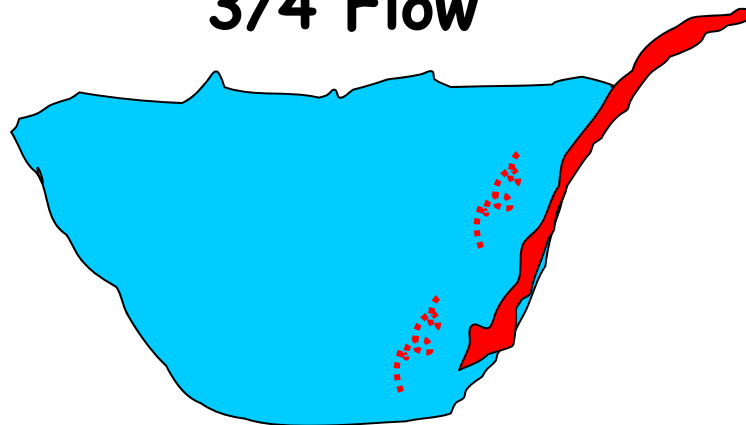
Bank / Berm

Bank Attached
Active Zone

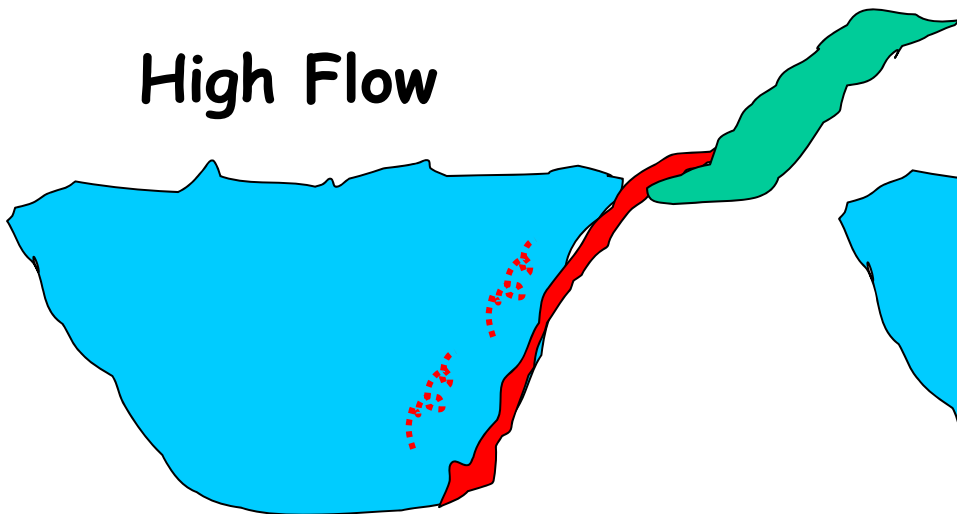
Low Flow



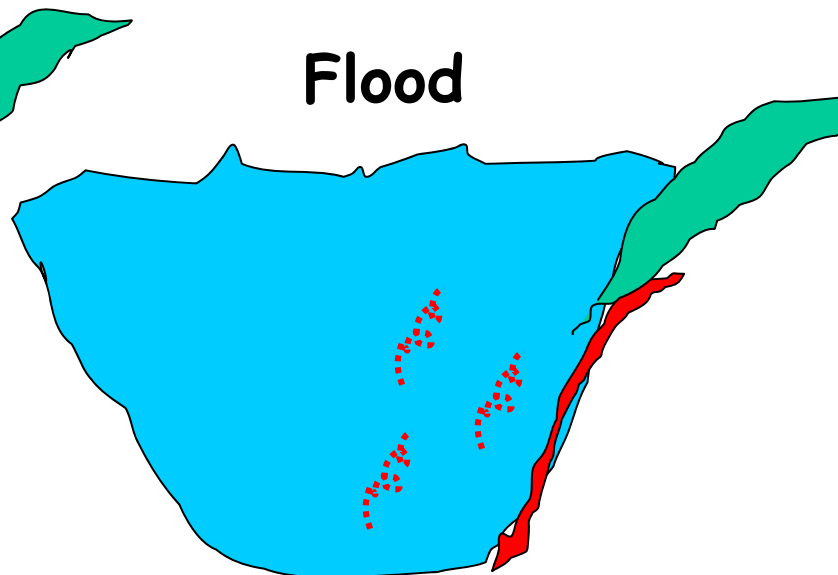
3/4 Flow



High Flow

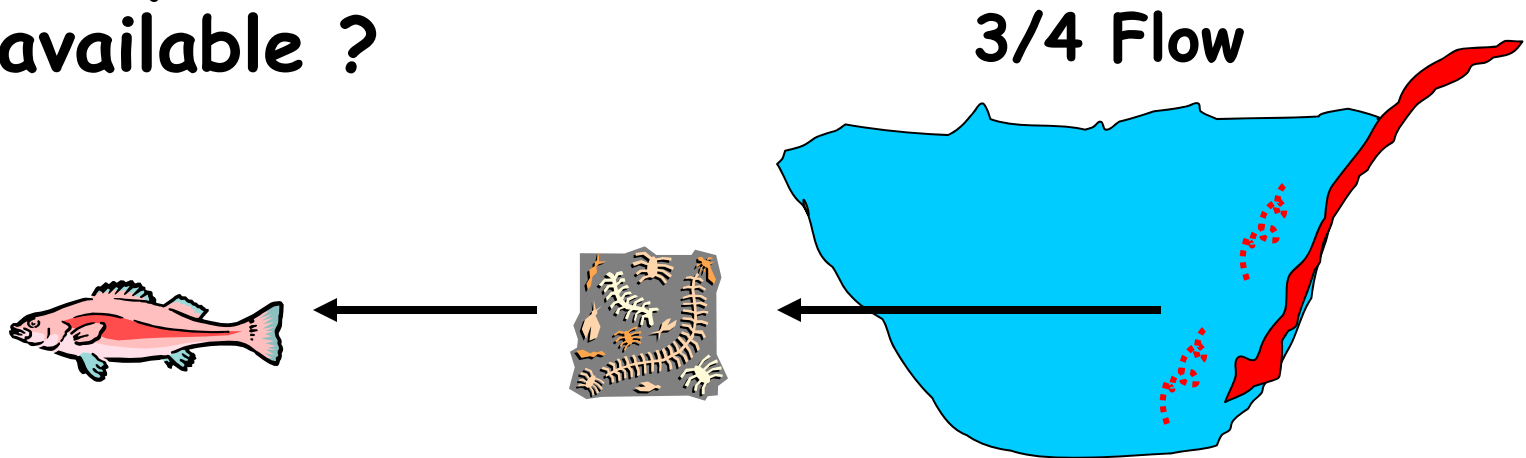


Flood



Bonus Question

- If this picture is accurate, what is the mechanism for making the mercury bioavailable ?



What Do You Think ?

- Q: If Jim Pizzuto is correct, then where did all the mercury go ?
- A: It's still here, sending us a signal.

Summary of EcoStudy Phase 1

- Work is on schedule, and according to plan.
- Several areas remain where additional work is needed:
 - loading
 - episodic (maybe)
 - conceptual system model
 - geomorphological
- Excellent linkage with SRST efforts

EcoStudy Phase 2 - Initial Work

- Begin to assemble data for developing a mercury food web model for the aquatic, riparian and terrestrial zones. - Dr. Newman
- Determine locations for in situ experimental studies
 - benthic flux chamber
 - toxicology
 - methylation
 - biological uptake

SRST - 2007

- **Complete:**
 - next segment of geomorphology study
 - reach investigations - water column, trends, sources, mechanisms
 - initial conceptual system model
 - earthworm / soil investigation
 - next phase of bird study

SRST - 2007

- **Get started on:**
 - **Bat study**
 - **Building an initial trophic model - aquatic**

Publications / Sci. Meetings

- SETAC NA - November 2006
- Publications
 - Fish diet (4)
 - Garden (2)
 - ?

SRST Meetings - 2007

- **January 23**
- **April 10**
- **July 10**
- **October - Expert Panel Meeting**

Charge to Experts

- As it relates to SRST work to date, and proposed for 2007,
 - prepare written comments that address,
 - where uncertainties remain - data gaps
 - areas that have not received sufficient attention (in your opinion)
 - areas where sufficient information exists and which may require less or no attention in the future
 - Comments due December 5, 2006