

What We Know or What We Think We Know



Expert Panel Meeting
October 10-11, 2007

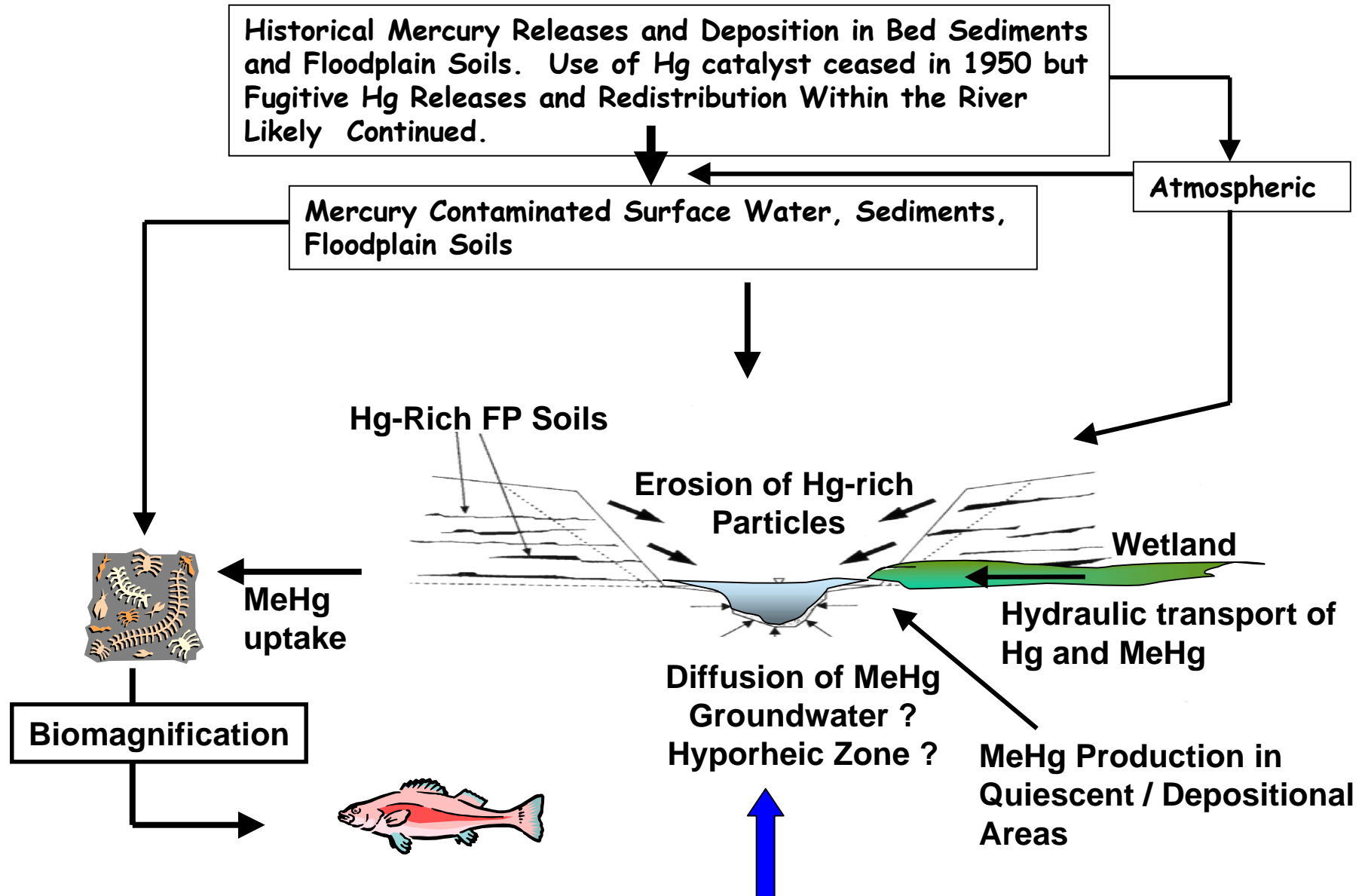


Are We There Yet ?



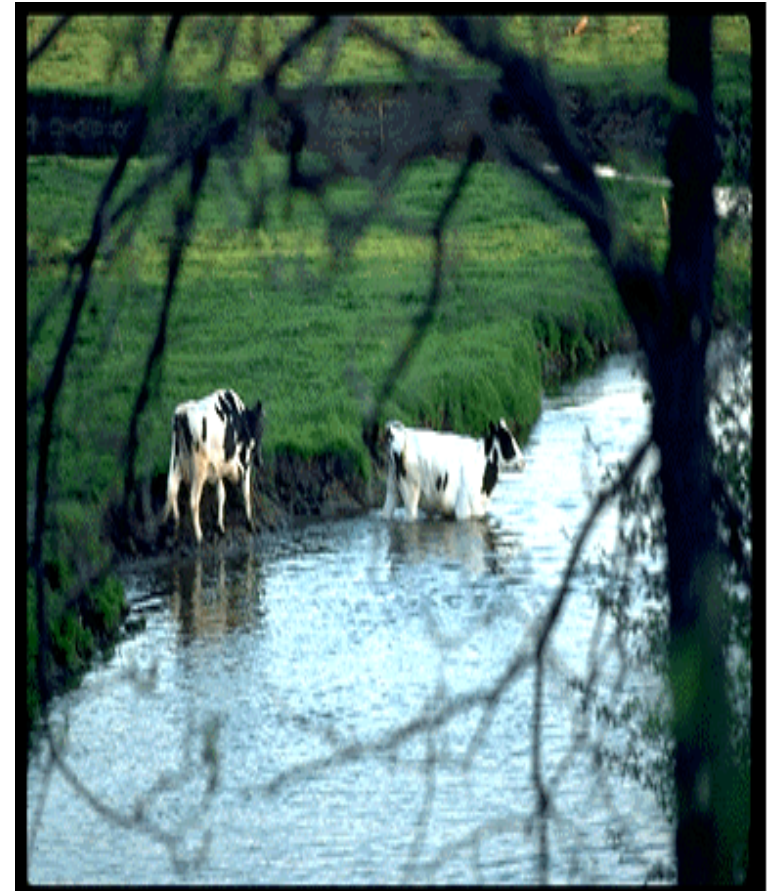
If We're Not, Then How Much Longer ?

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



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
 - Mill dams might play role in erosion rates
 - Cattle deposits
 - Large woody debris



Trends, Sources, Mechanisms

- Turner & Jensen
 - No clear evidence of point source input of mercury to water column
 - Role of gravel beds / bars, side channels, pore water and hyporehich zone
 - Wetting / drying influence on FP soils
 - Limited information on the role of alluvial groundwater
 - Large woody debris - areas of MeHg production

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
 - Four high water events sampled, limited evidence that they contribute significantly to increased Hg levels in biota

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

Birds

- Everybody is carrying a share, some more than others.
- Uncertainties with establishing reproductive effects.
- Need to determine exposure source term for swallows, correlations with blood Hg levels
- Work needed to establish field-based TRV
- Mallard work, analytical chem not completed, but some intriguing results from clutch samples



Herps

- **Bill Hopkins and team**
 - Salamanders and toad from South River show elevated Hg compared to those from ref areas
 - Salamander with "stream" related life history and feeding habits, showed higher levels of Hg than did one with more "terrestrial" life history and feeding habits.

Food Web

- **Mike Newmann**
 - **Some samples remain to be processed**
 - 16 species from 6 locations
 - Initial model shows similarities in the bioaccumulation factors
 - Should be able to do “what if” scenario gaming in the near future

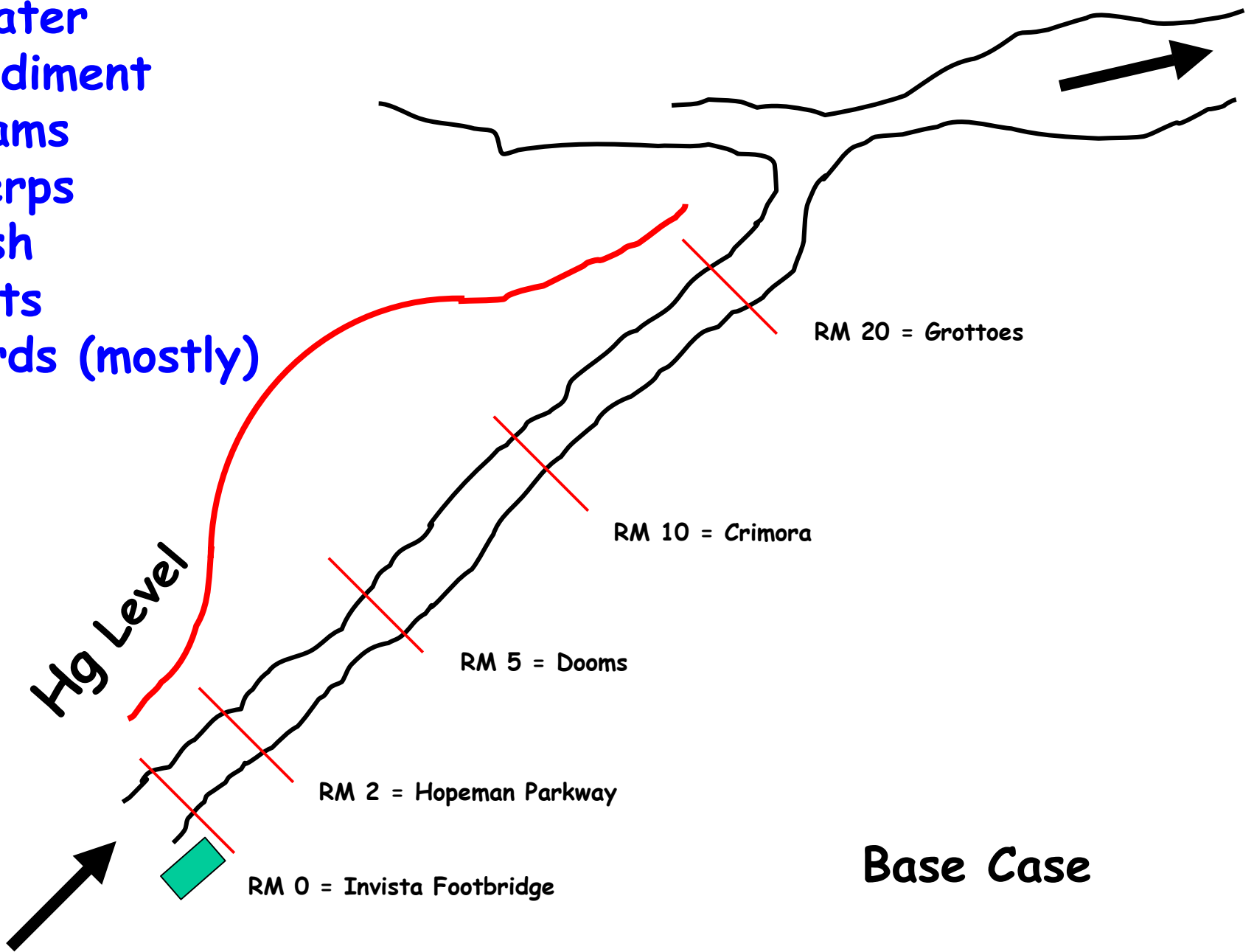
Summary of EcoStudy Phase 1

- Work is complete.
- Several efforts will continue as needed:
 - episodic
 - conceptual system model
 - geomorphological
- Excellent linkage with SRST efforts

Working Hypotheses

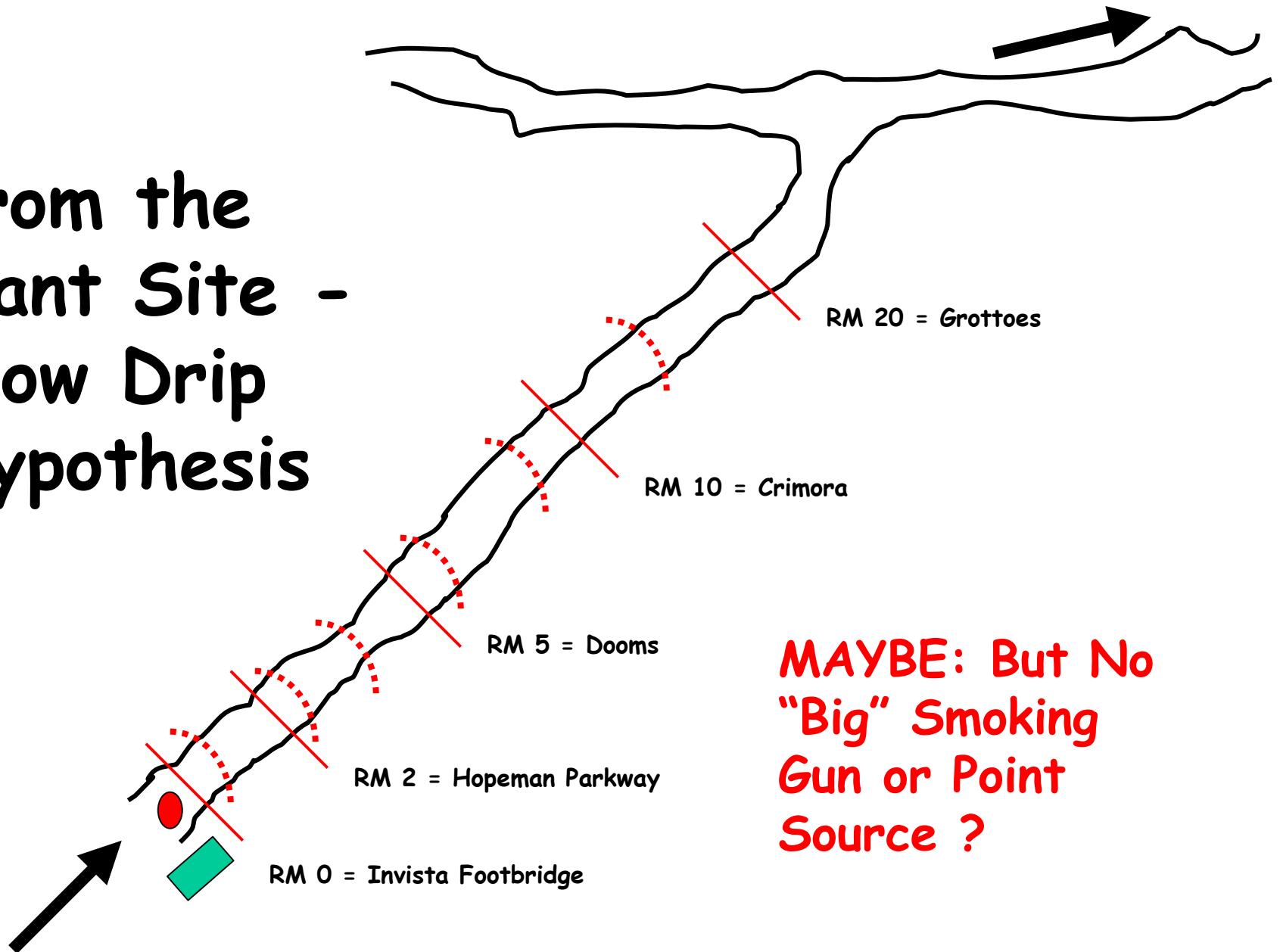
- First draft completed.
- Revisions suggested:
 - reformat as hypotheses, or statements that can be tested, boil them down
 - consider splitting for - river reach, or flow conditions
 - re-connect the biological portion
- Excellent linkage with SRST efforts

Water
Sediment
Clams
Herps
Fish
Bats
Birds (mostly)



Base Case

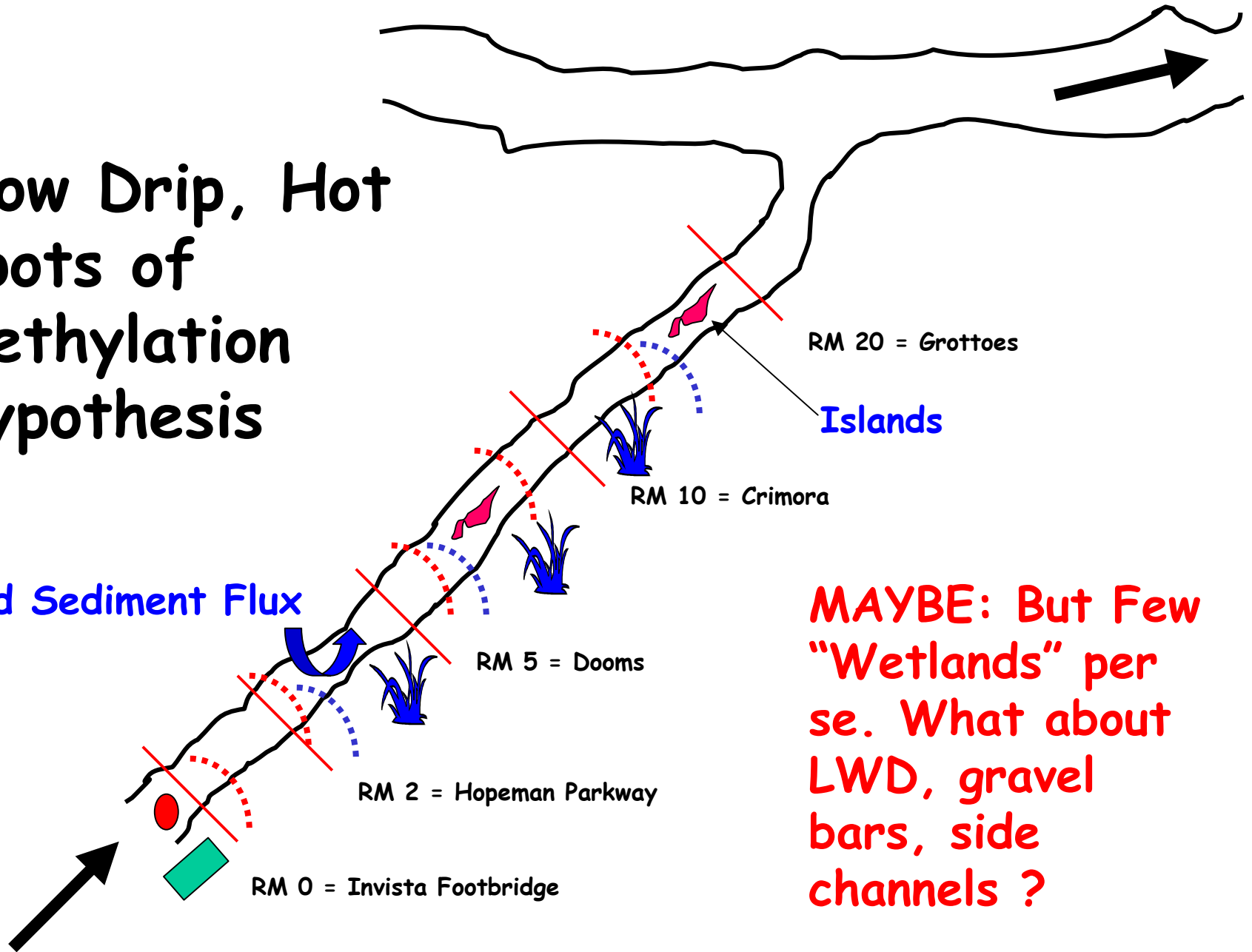
From the Plant Site - Slow Drip Hypothesis



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

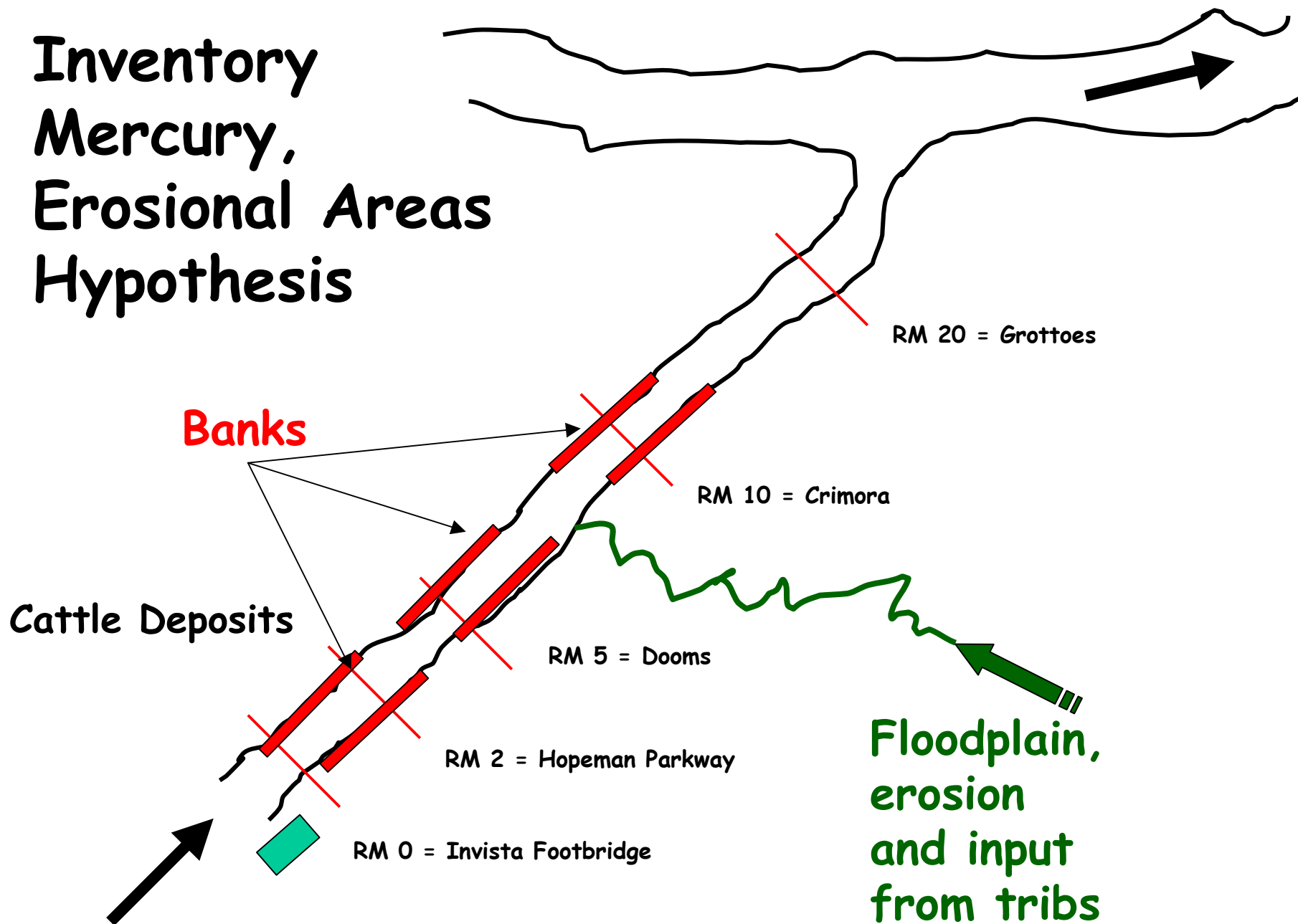
Slow Drip, Hot Spots of Methylation Hypothesis

Bed Sediment Flux

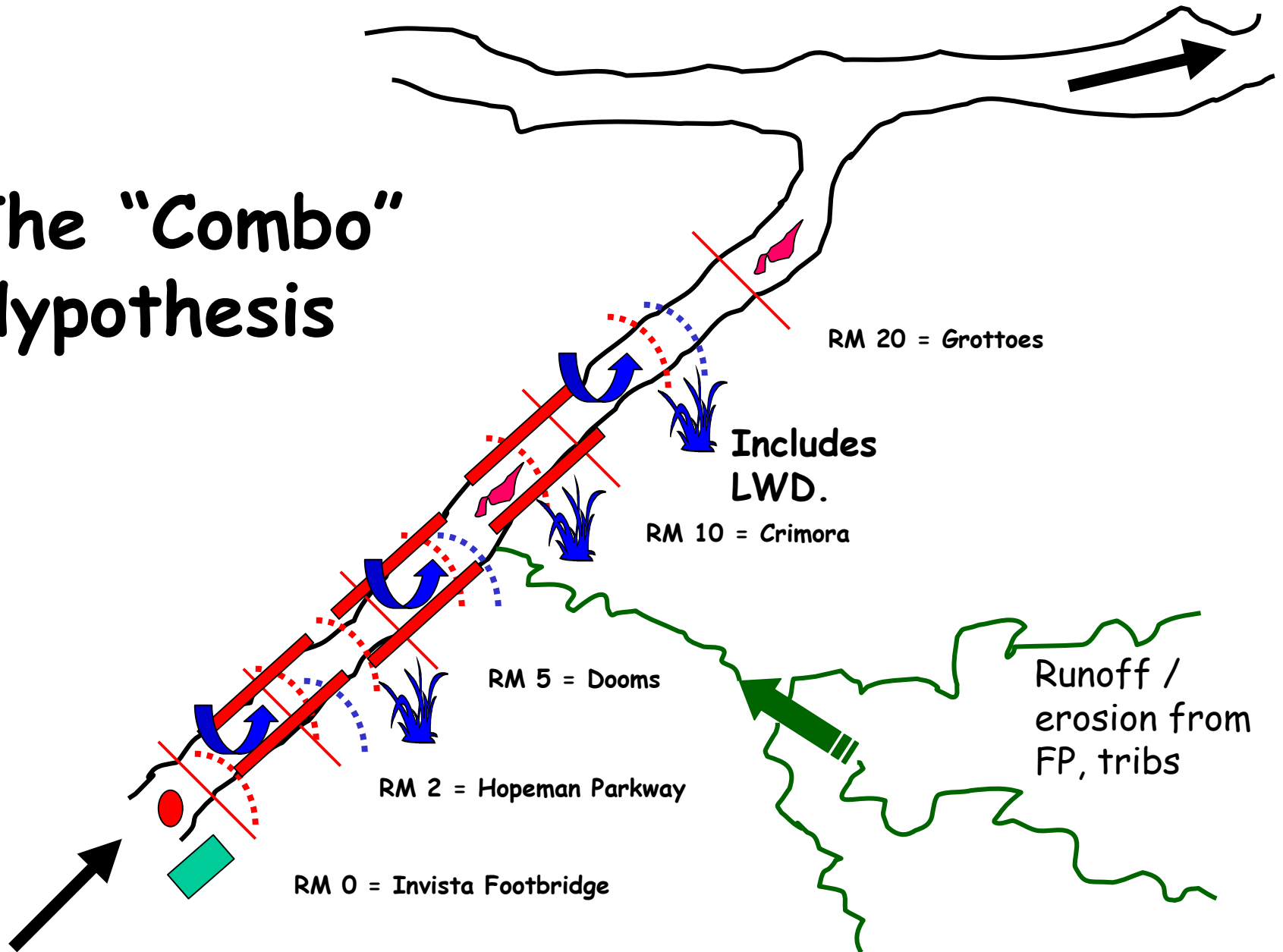


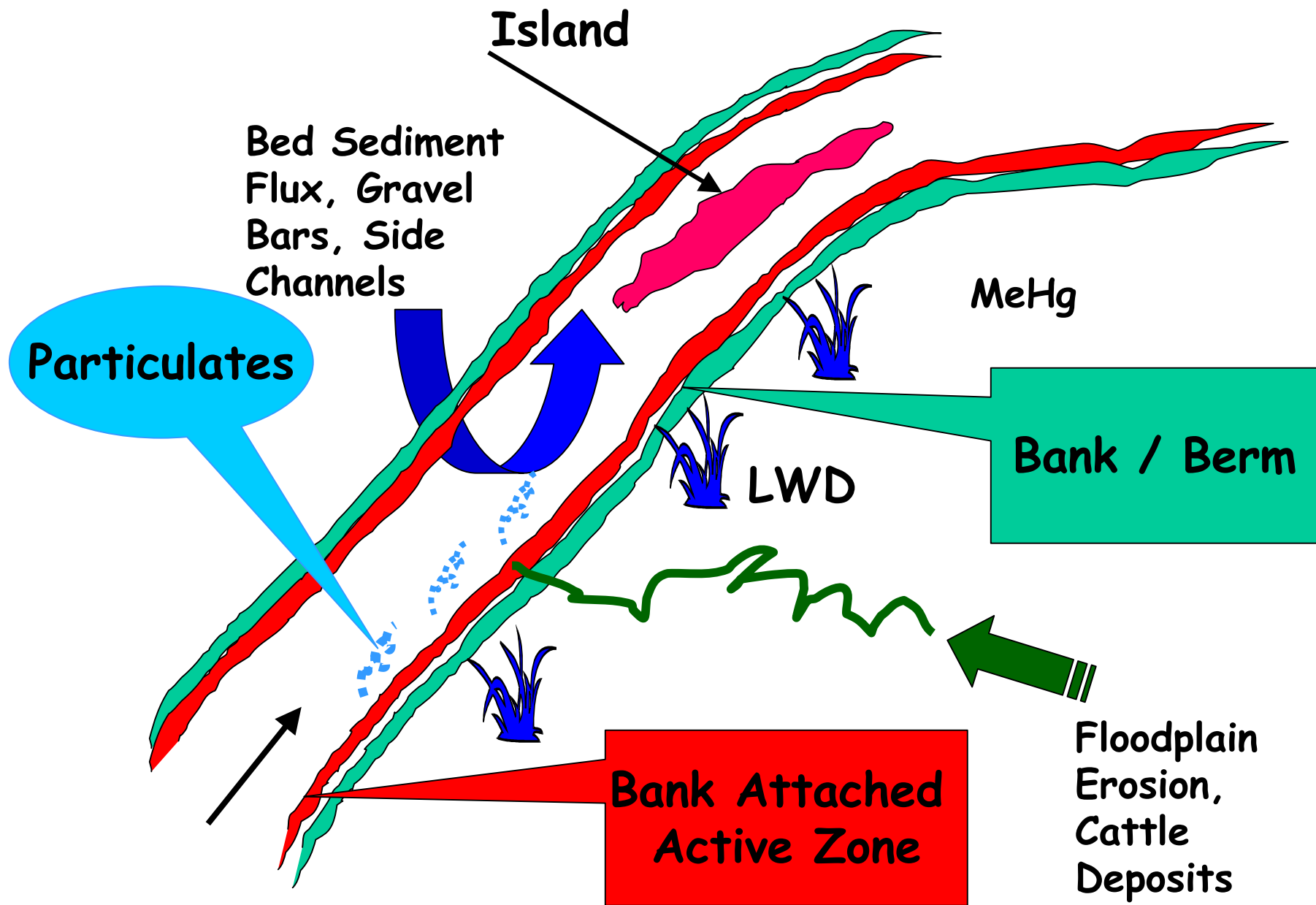
MAYBE: But Few "Wetlands" per se. What about LWD, gravel bars, side channels ?

Inventory Mercury, Erosional Areas Hypothesis

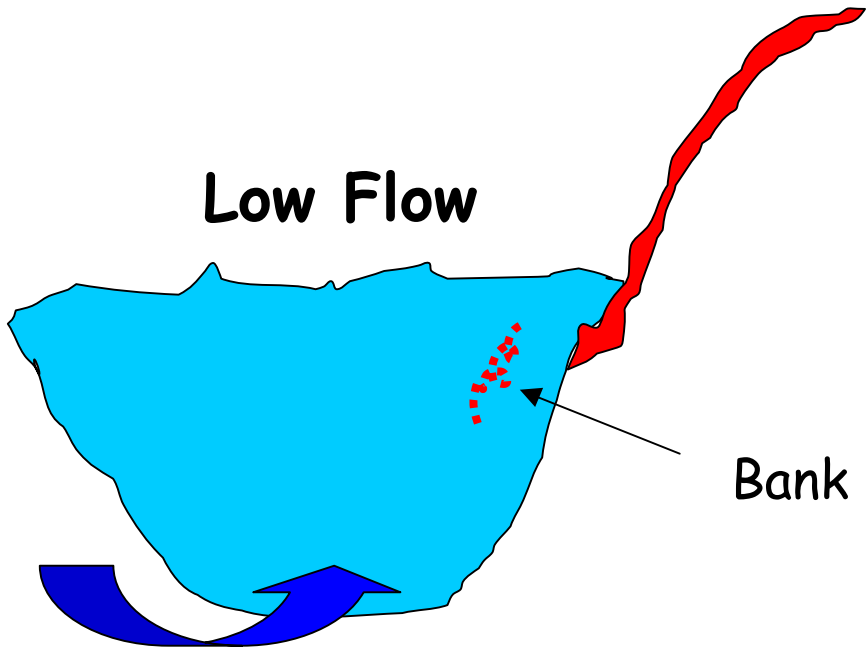


The "Combo" Hypothesis





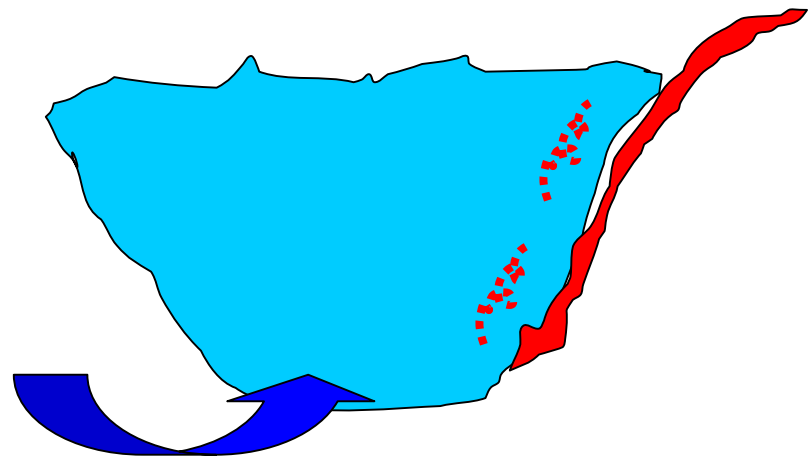
Low Flow

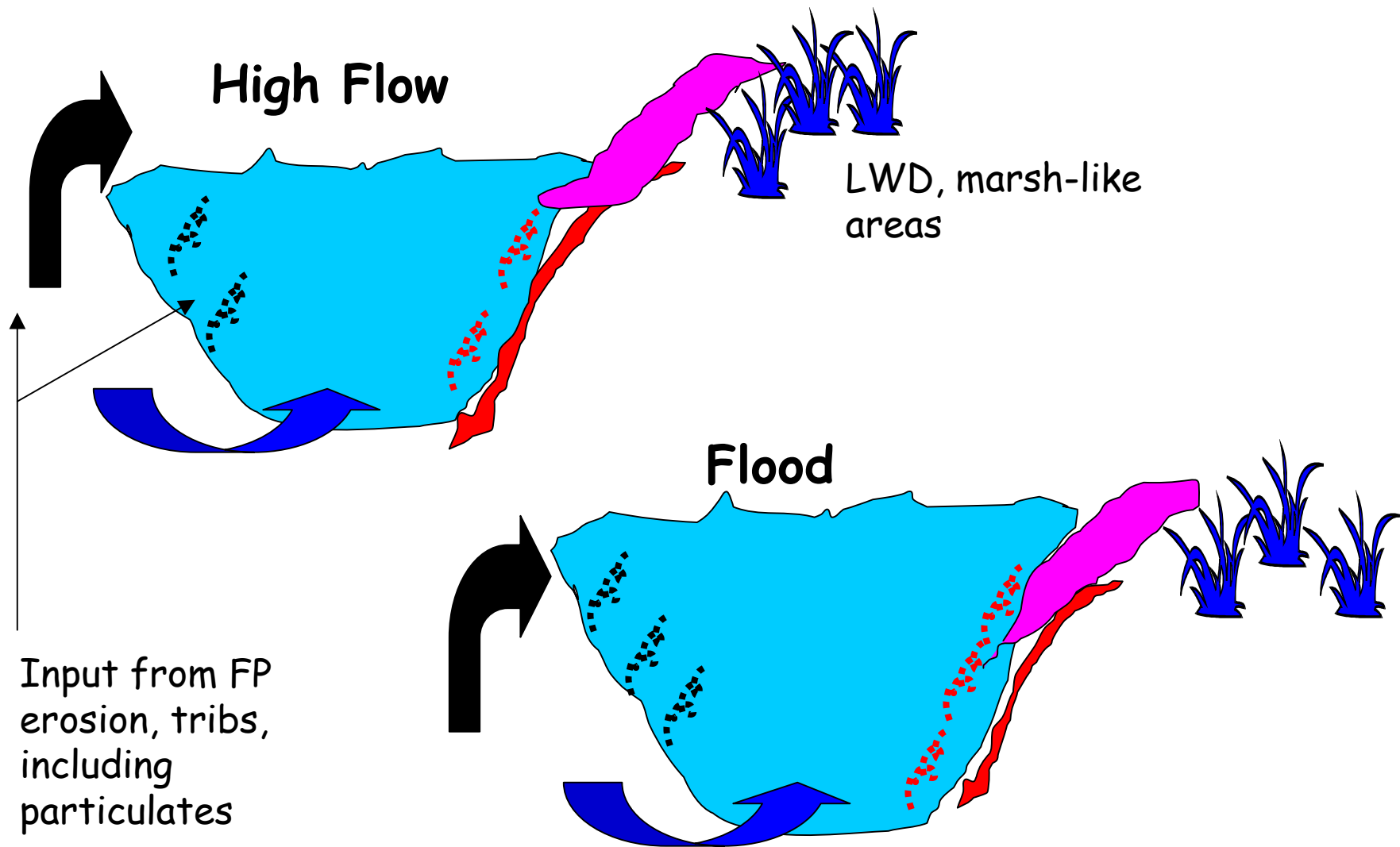


Bank particulates

Pore water, GW
intersection,

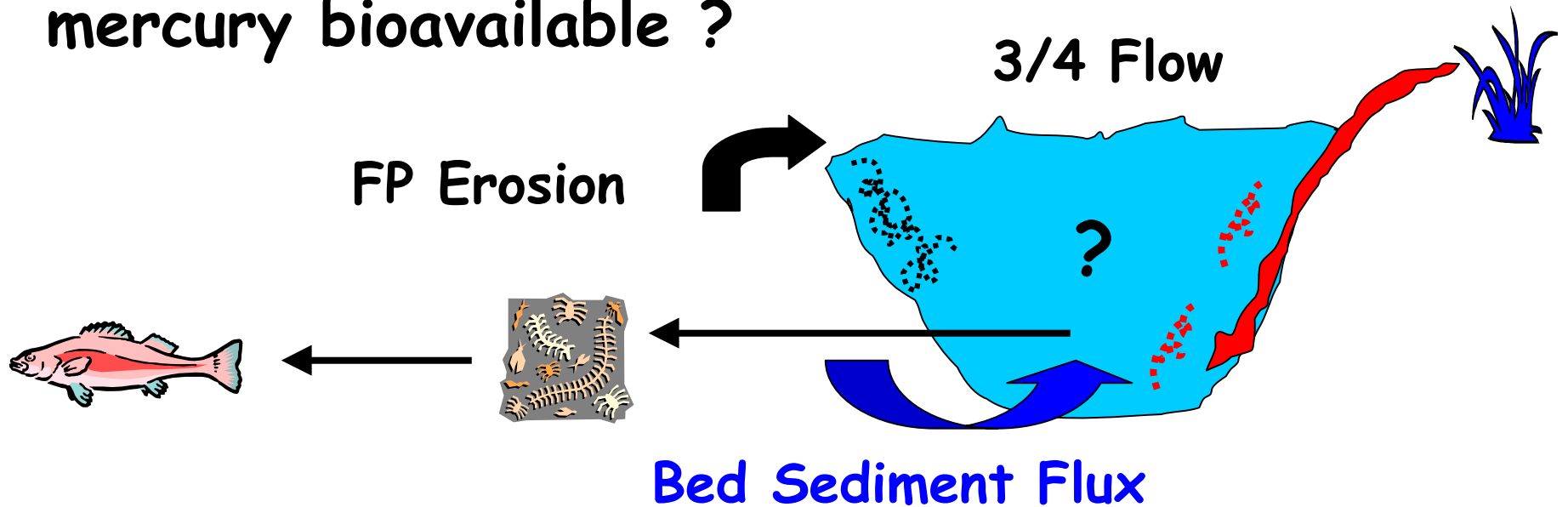
3/4 Flow





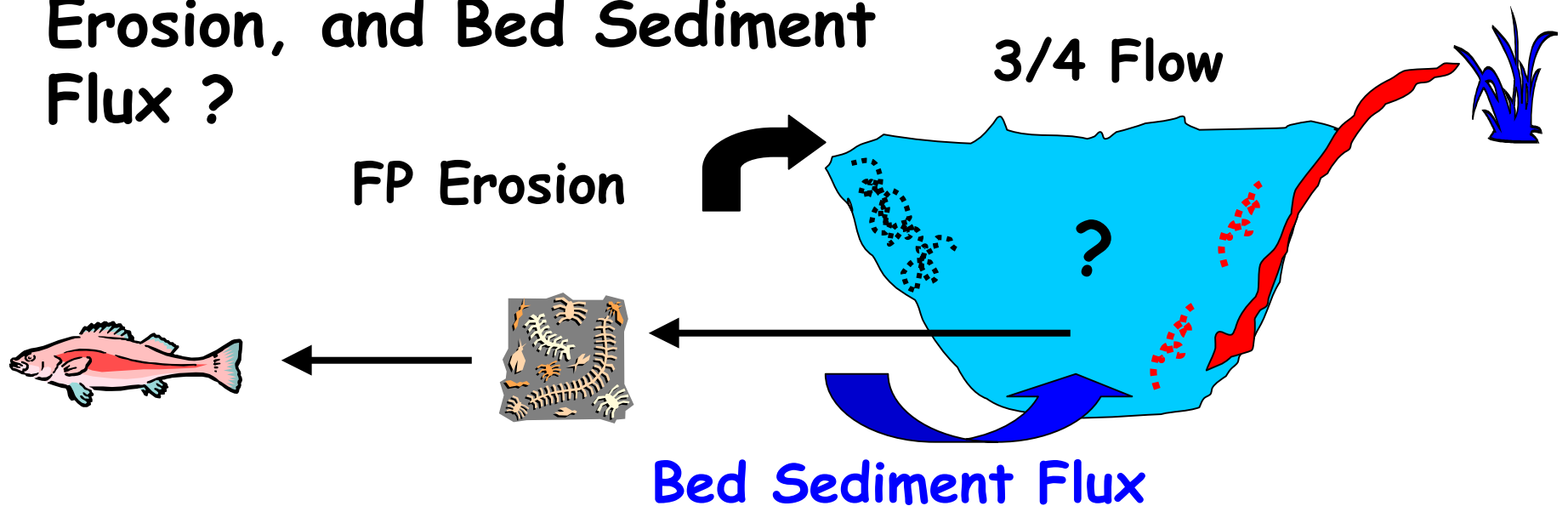
One Year Later - Bonus Question 1

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



One Year Later - Bonus Question 2

- What are the Relative Contributions (source?) from FP Erosion, Bank Erosion, and Bed Sediment Flux ?



Sooner, Or, Later

THE ANSWER



Next Steps



EcoStudy Phase 2

- Finalize / assemble data for developing a mercury food web model for the aquatic, riparian and terrestrial zones. - Dr. Newman
- Conduct in situ experimental studies
 - benthic flux chamber
 - methylation
 - biological uptake

SRST - 2008

- **Complete:**
 - next segment of geomorphology study
 - reach investigations - trends, sources, mechanisms, flux measurements
 - revise conceptual system model
 - birds, bats, herps

SRST - 2008

- **Get started on:**
 - Build an initial trophic model - aquatic and terrestrial
 - New mechanistic work - bacterial MeHg assays
 - Concepts for hazard / effects evaluations: field or laboratory based

Publications / Sci. Meetings

- **SETAC NA - November 2007**
- **Virginia / WVA WQ - November 2007**
- **SETAC WC - August 2008**
- **Publications**
 - **Ecostudy Phase 1 - 2008**

SRST Meetings - 2008

- January 22 - web based
- April 8
- July 15
- October - Expert Panel Meeting

Discussion

