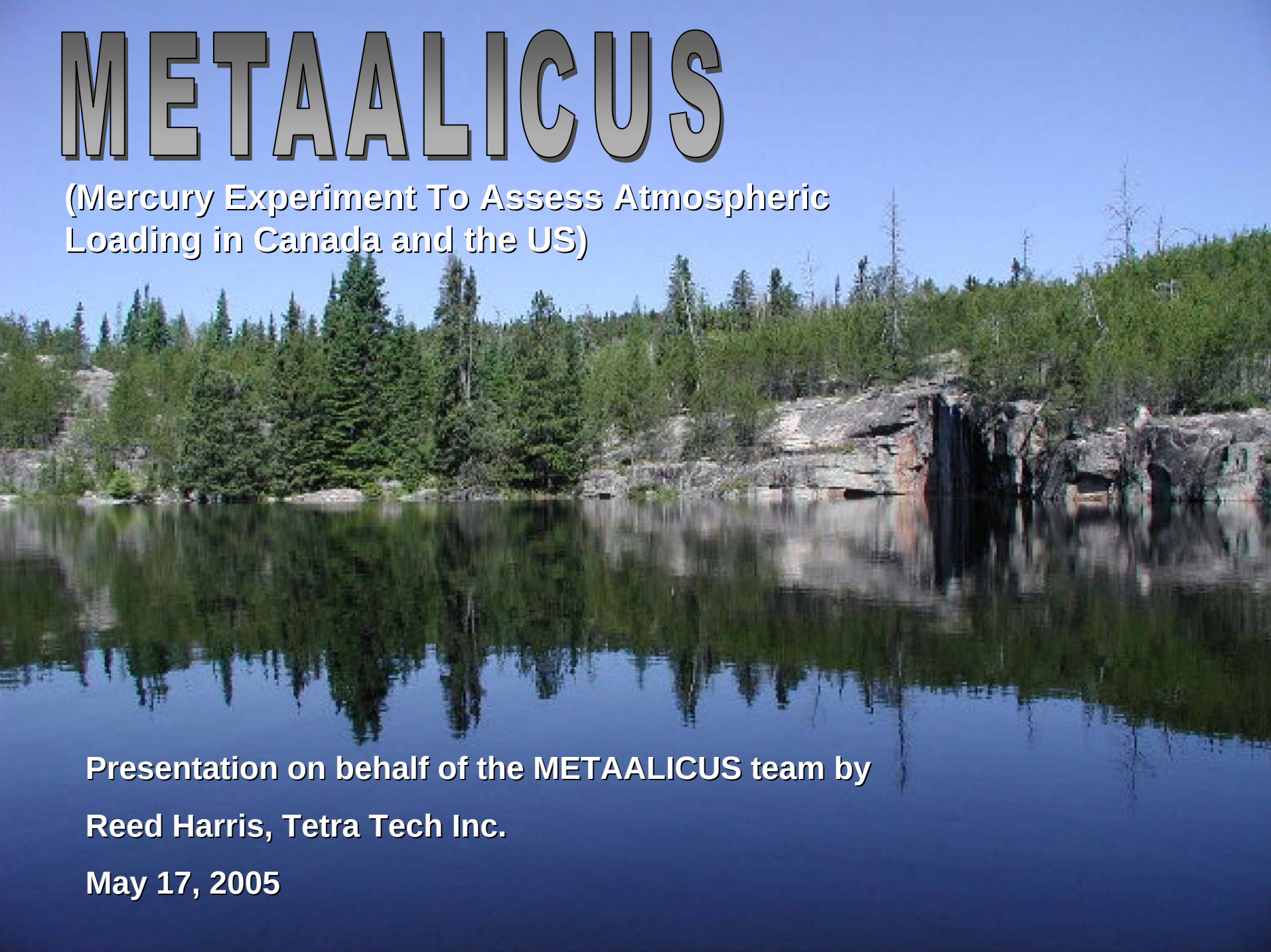
METAALICUS

(Mercury Experiment To Assess Atmospheric Loading in Canada and the US)



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May 17, 2005

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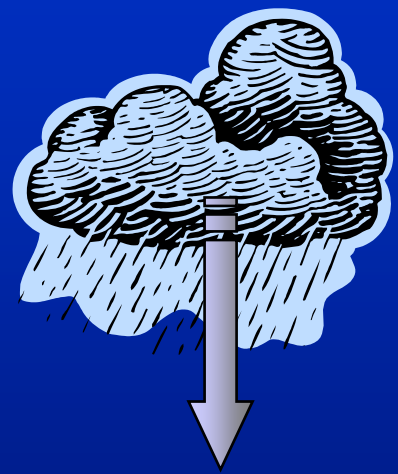
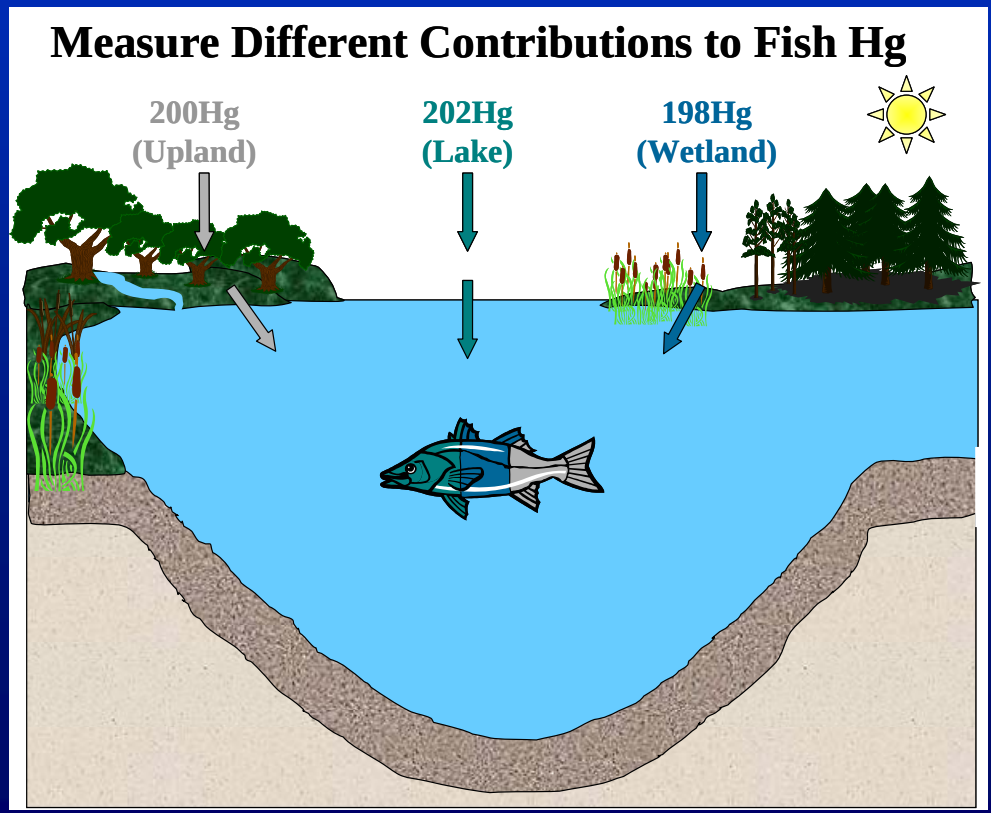
What is the relationship between atmospheric Hg deposition and fish Hg concentrations?



What is METAALICUS?

- ***A loading experiment*: Mercury is being added to a lake and its surrounding watershed.**

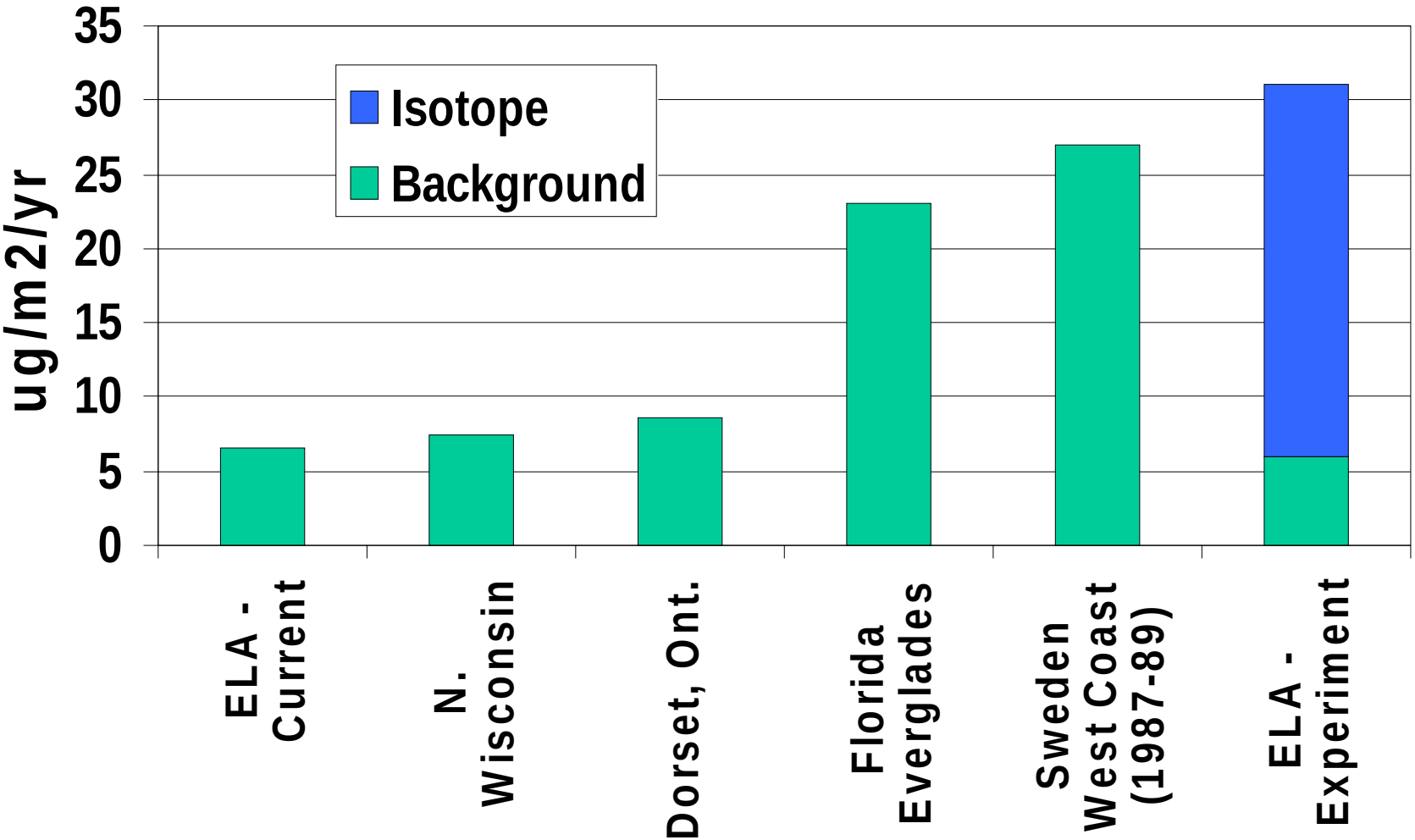


Public and Private Sector Support (listed alphabetically)

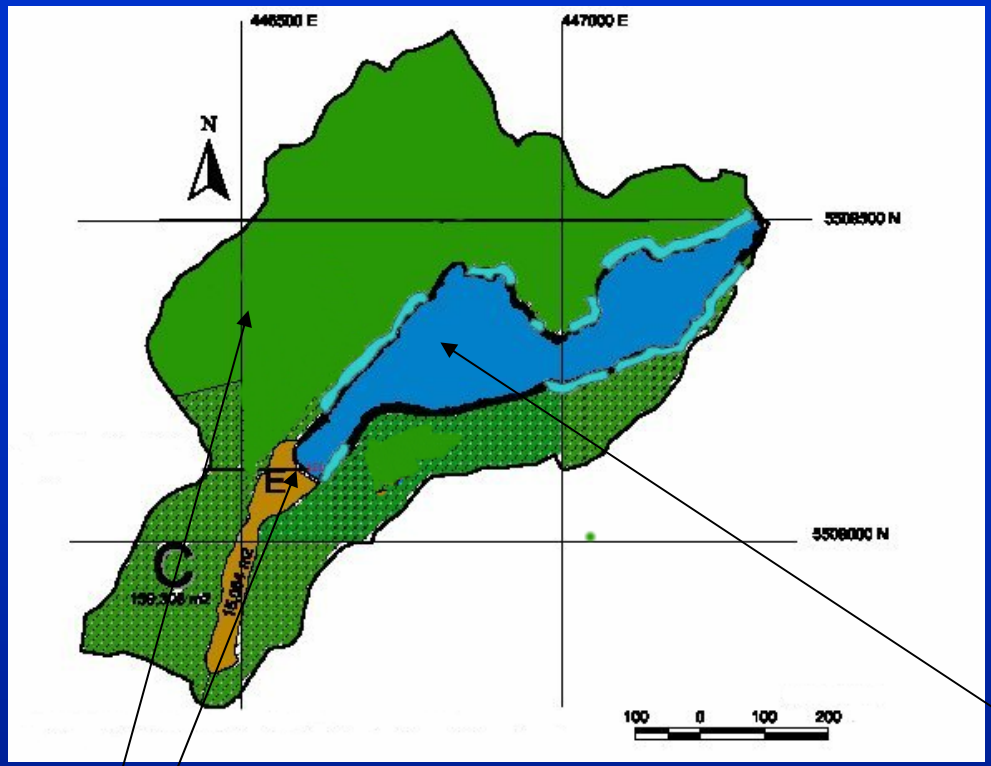
Canadian Forest Service
Environment Canada
EPRI and member utilities, including Southern Company, Tennessee Valley Authority, Dairyland Power Cooperative, South Carolina Electric and Gas, Minnesota Power, City Public Service of San Antonio.
Fisheries and Oceans Canada
National Sciences Engineering and Research Council of Canada (NSERC)
National Science Foundation
US Environmental Protection Agency
US Geological Survey
US Department of Energy
Wisconsin Focus on Energy Program

The Experimental Lakes Area Research Facility

How much is wet Hg deposition being increased?

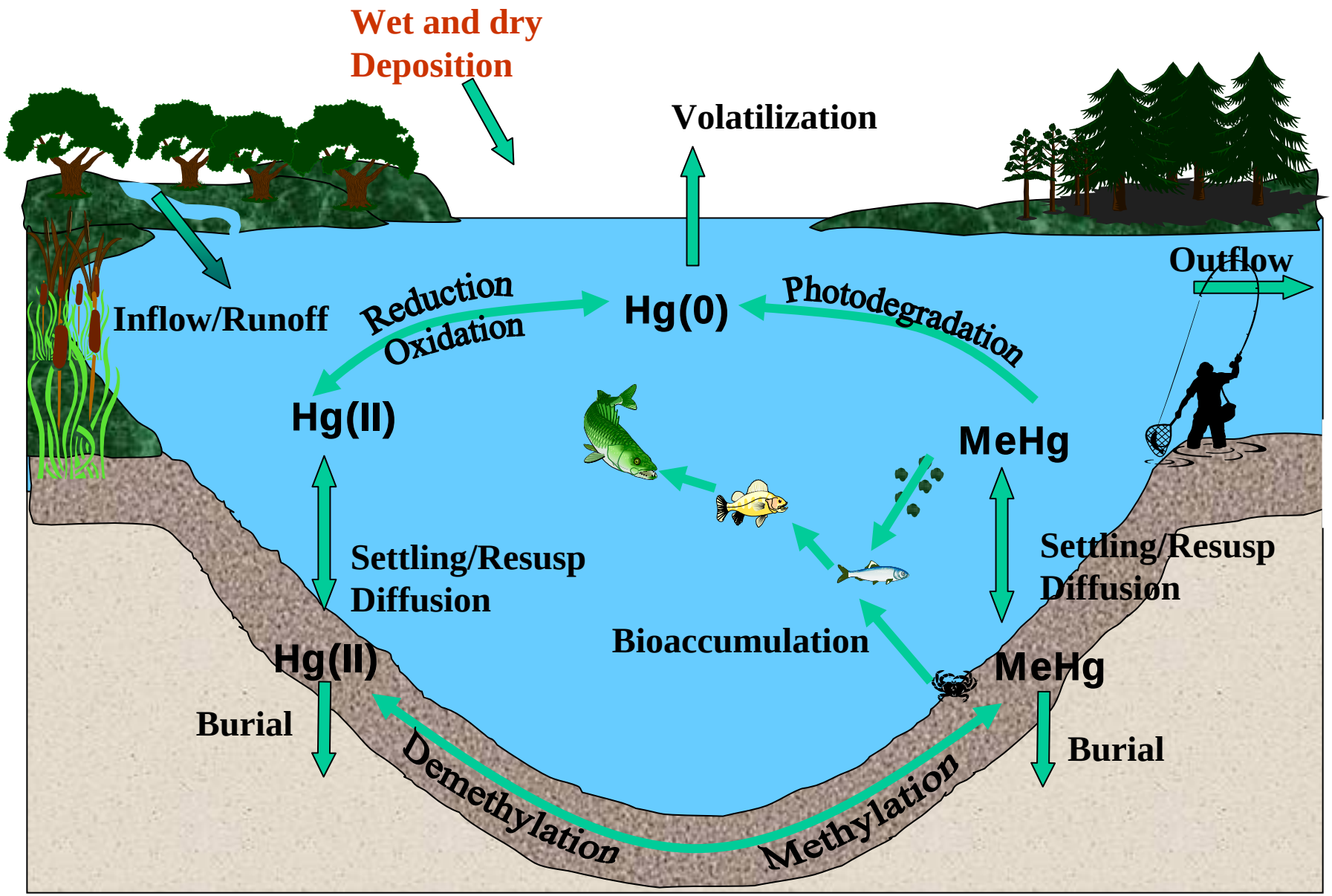


Characteristics of Lake 658	
Parameter	**Value**
Lake area	8.4 ha
Wetland area	1.7 ha
Upland area	42 ha
Drainage pattern	Surface flow headwater lake
Maximum depth	~13 m
Hydraulic retention time	~ 5.5 years
pH	~ 6.5
Dissolved organic carbon	~ 9 mg L^{-1}
Lake productivity	Low
Predatory fish	Northern pike

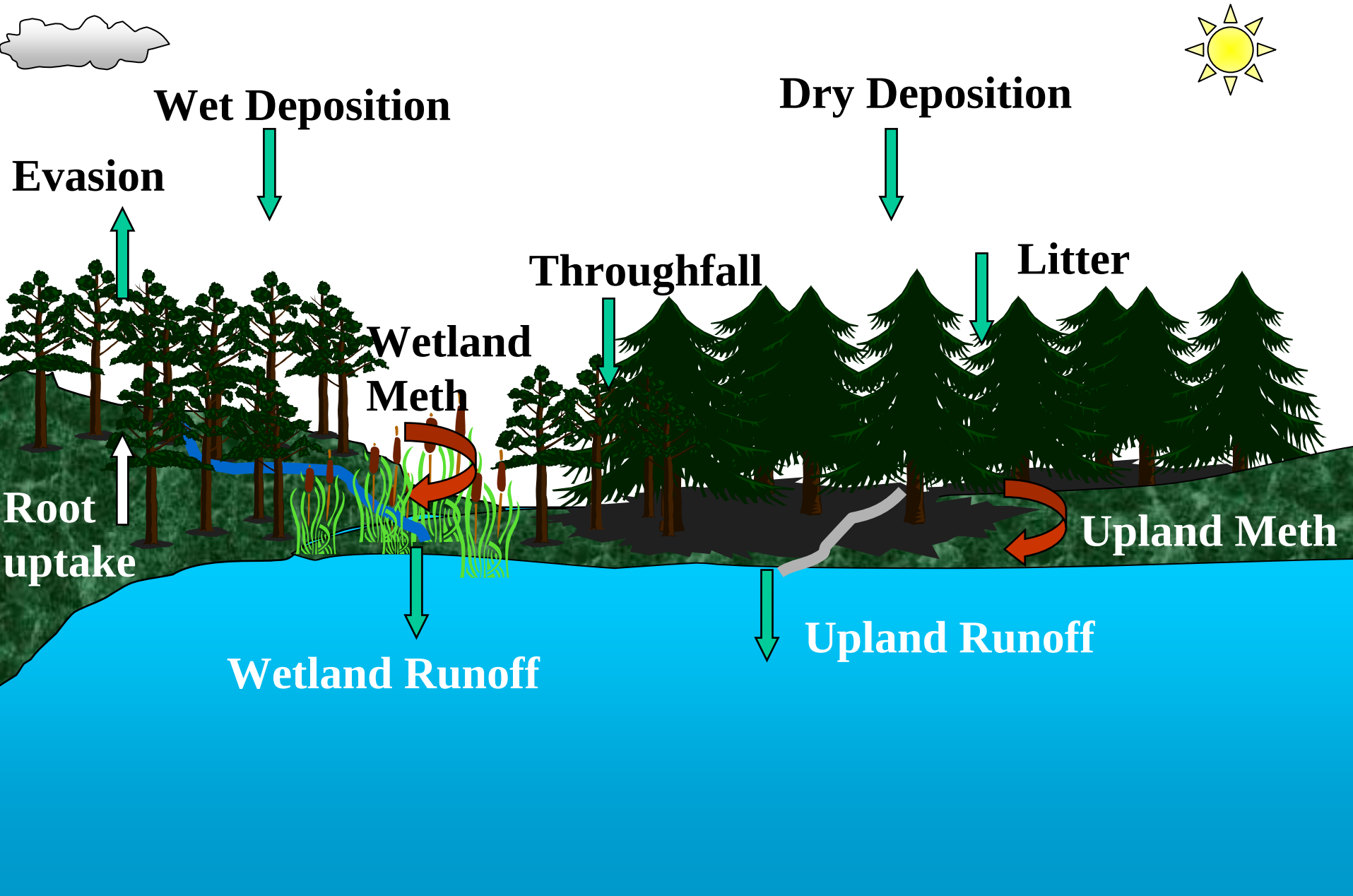


Hg applications by plane and boat

METAALICUS is looking at ….



METAALICUS in the watershed



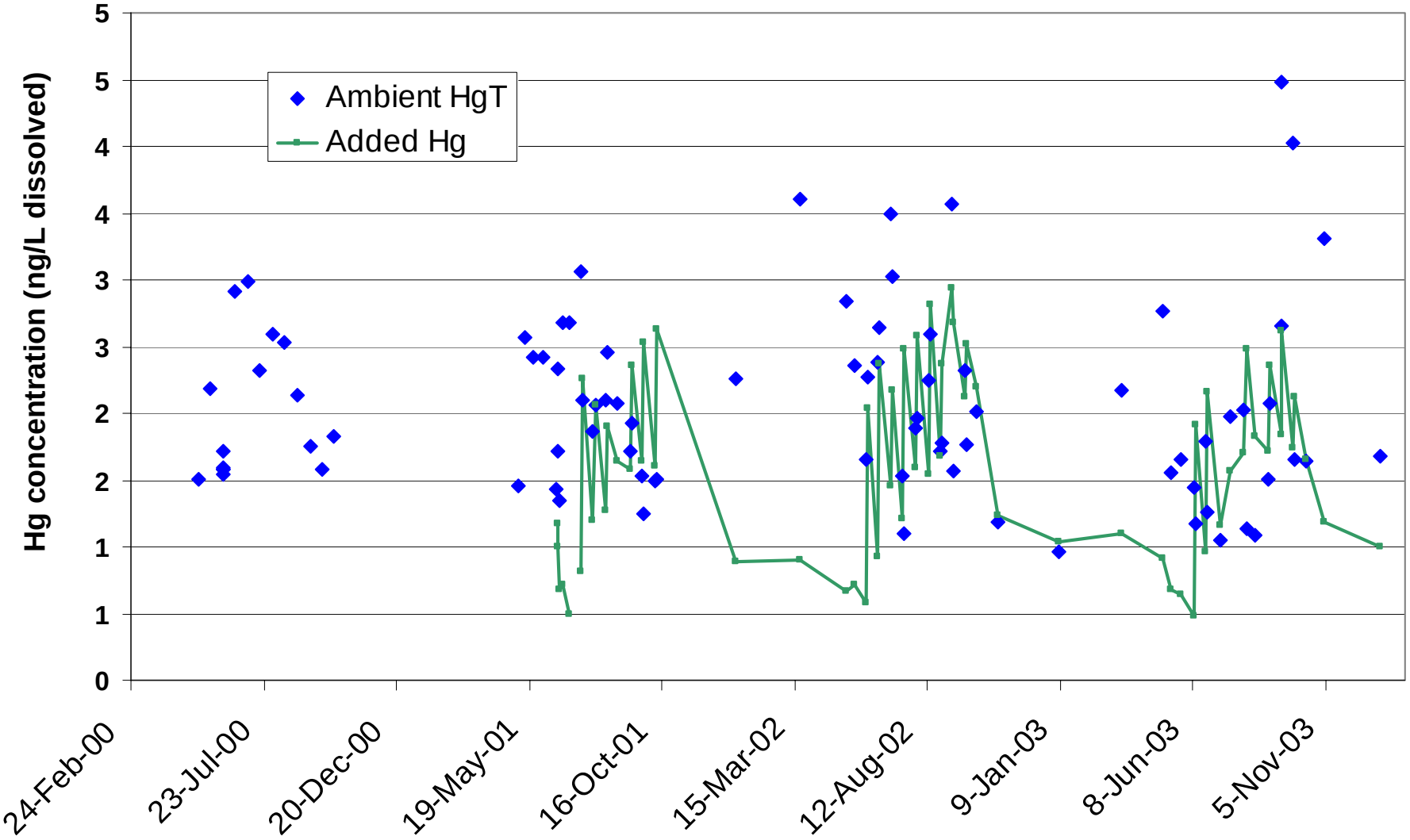
METAALICUS results to-date

1. *L658 surface water HgT responds quickly and ~ proportionally to increased Hg load to the lake.*
2. *Terrestrial spike export is low so far, although ambient runoff is very important (~70% of Hg(II) load).*
3. *Spike terrestrial export could dictate long term response*
4. *Anoxic hypolimnion appears to be important site of methylation, >50% of supply to lake?*
5. *Some parts of the ecosystem respond faster than others*
6. *Some systems may respond faster than others.*
7. *Too soon to quantify the timing and long-term magnitude of the fish Hg response as of 2004.*

What still needs to be addressed?

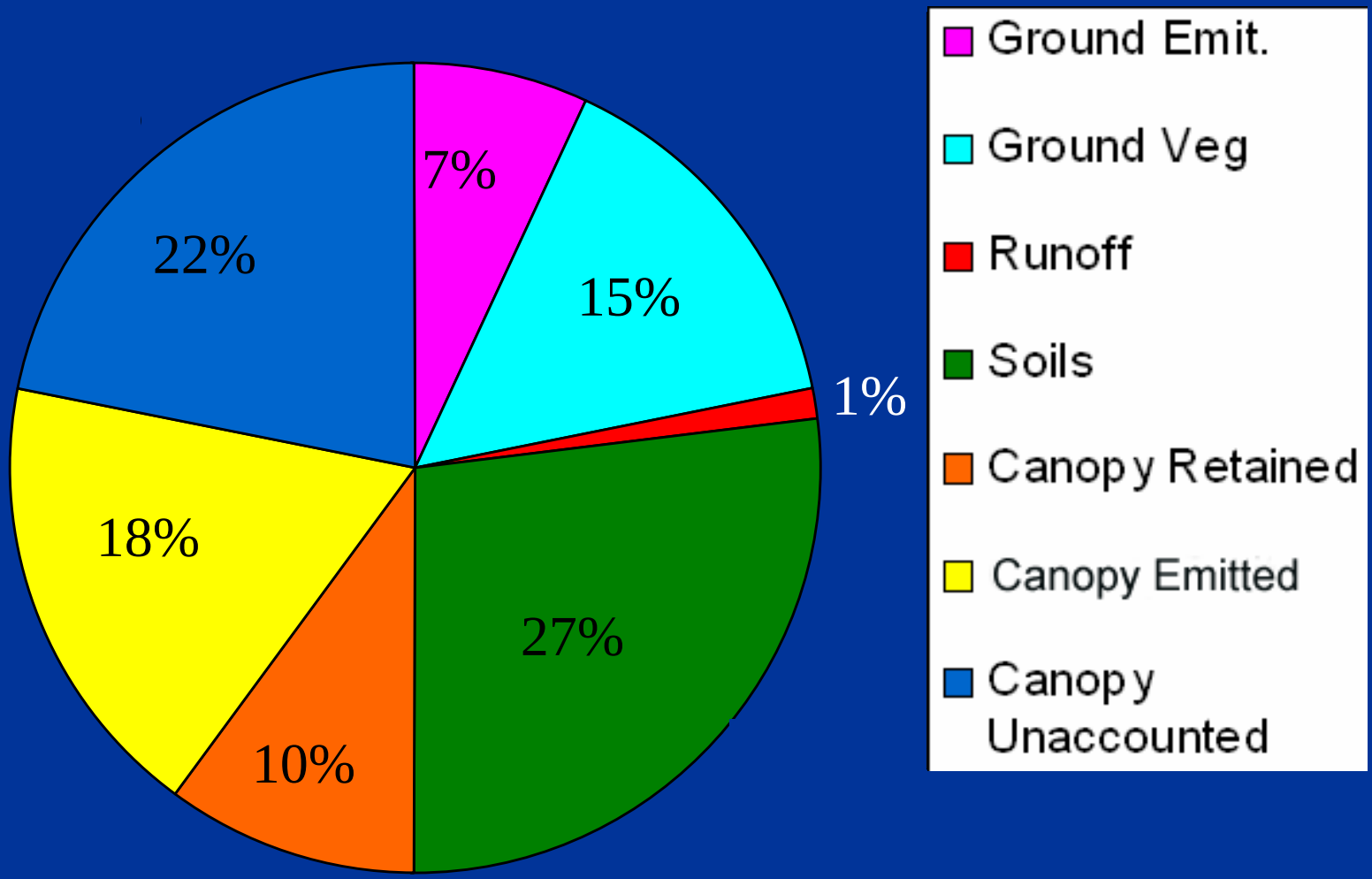
- *Better quantification of timing and long-term magnitude of the response of different components of ecosystem.*
- *Enough knowledge to extrapolate to other sites.*
- *Will the recovery be a mirror-image of the loading phase?*

Lake 658 Hg concentrations in surface waters 2001-2003



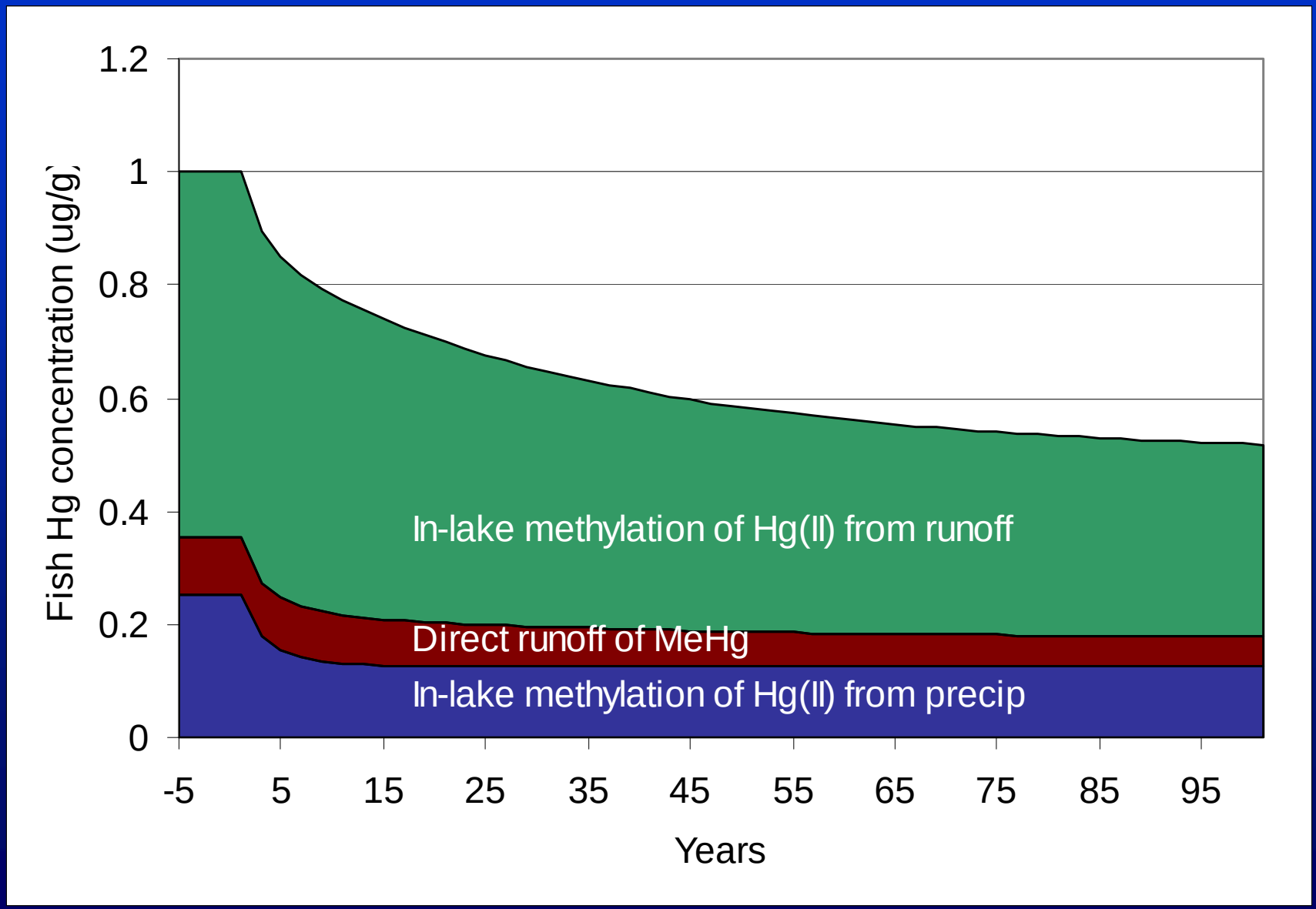
Data: Holger Hintelmann

Upland Spike Mass Balance (2001-02, fraction of applied Hg)

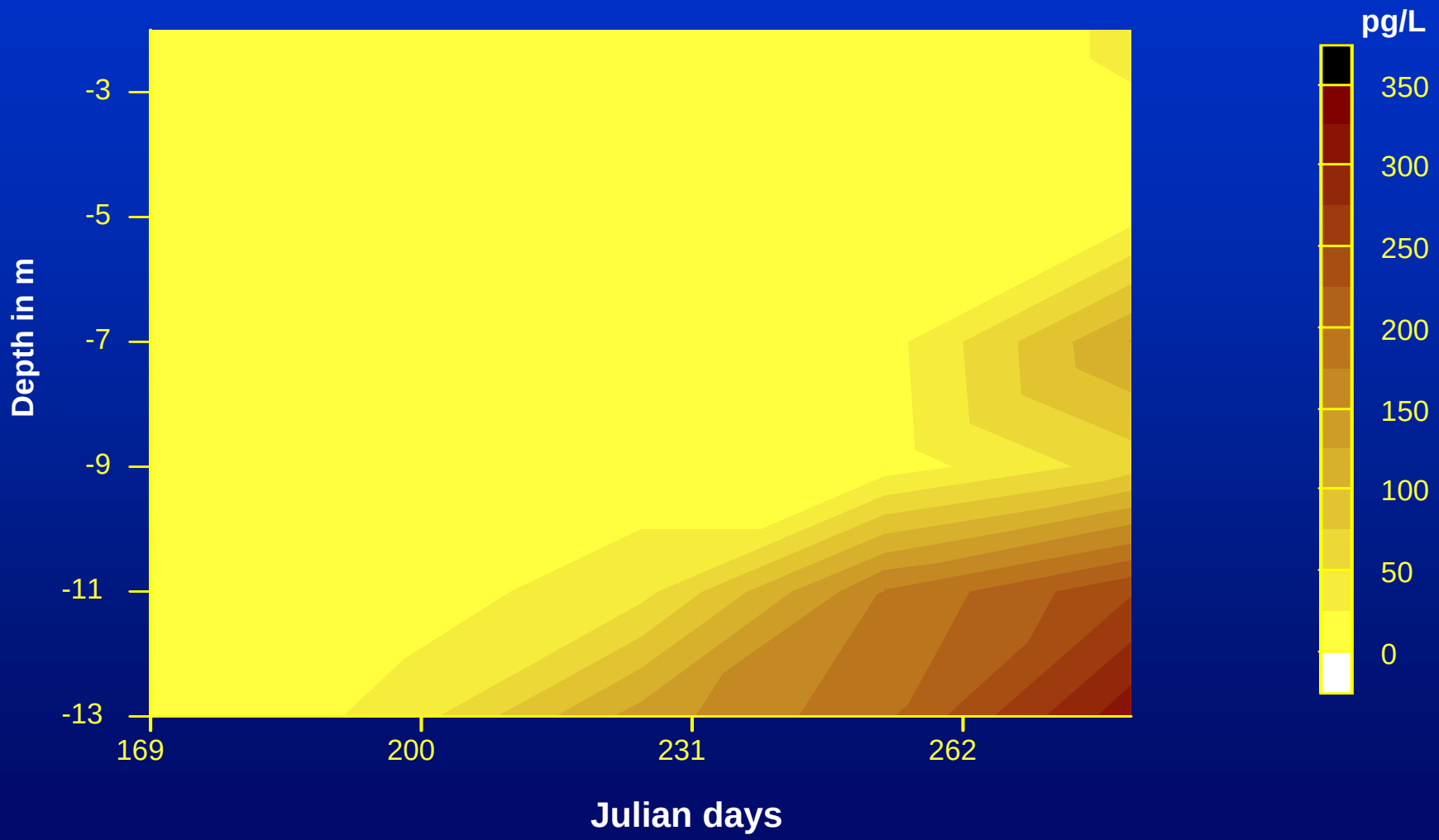


Krabbenhoft, St. Louis, Lindberg, Graydon

Terrestrial effect could be very important later

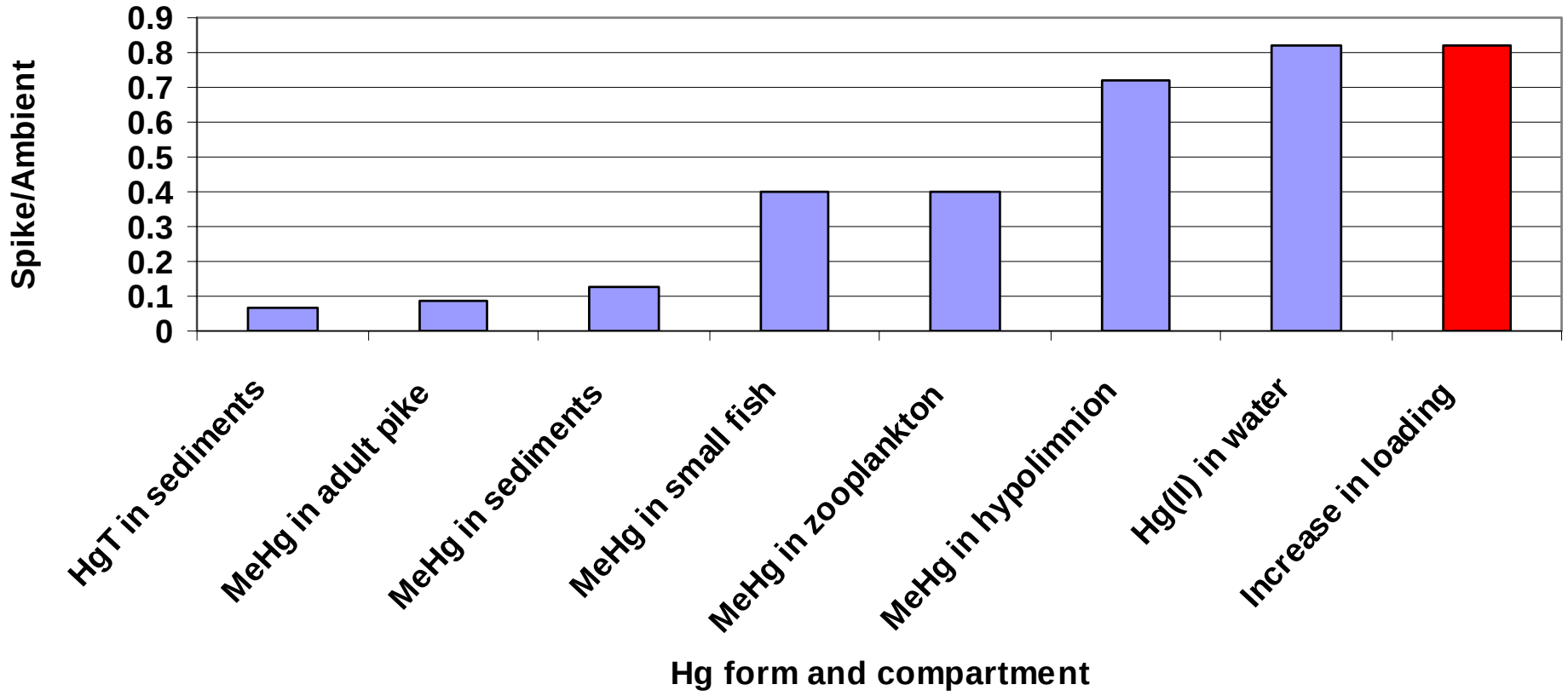


202-MeHg dissolved in Lake 658
June 18 - October 8, 2001



Source: H. Hintelmann, J. Hurley et al.

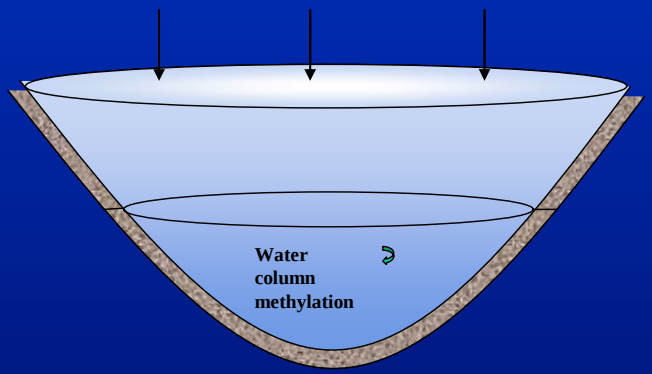
Some compartments are faster to respond than others



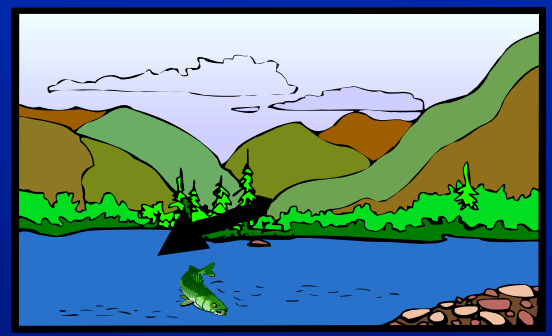
Results ~ late 2003

Some ecosystems may respond faster than others…

Faster response → **Slower response**



Seepage lake with water column methylation



Lakes receiving most of their Hg from watershed

What is the long-term magnitude and timing of the response?