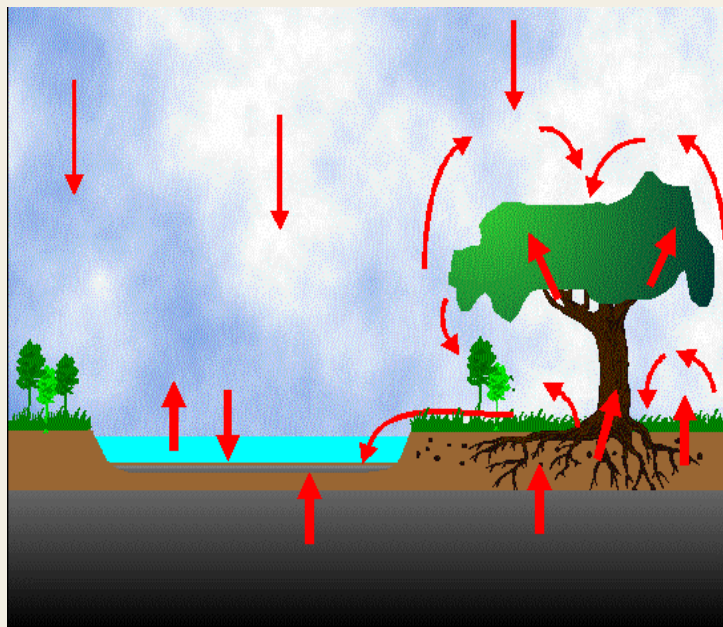




Biogeochemical Variation

A.N. Rencz

Natural Resources Canada – Geological Survey of Canada



Workshop on the Role of Geochemical Data in Ecological and Human Health Risk Assessment
Halifax, NS; March 17-18, 2010

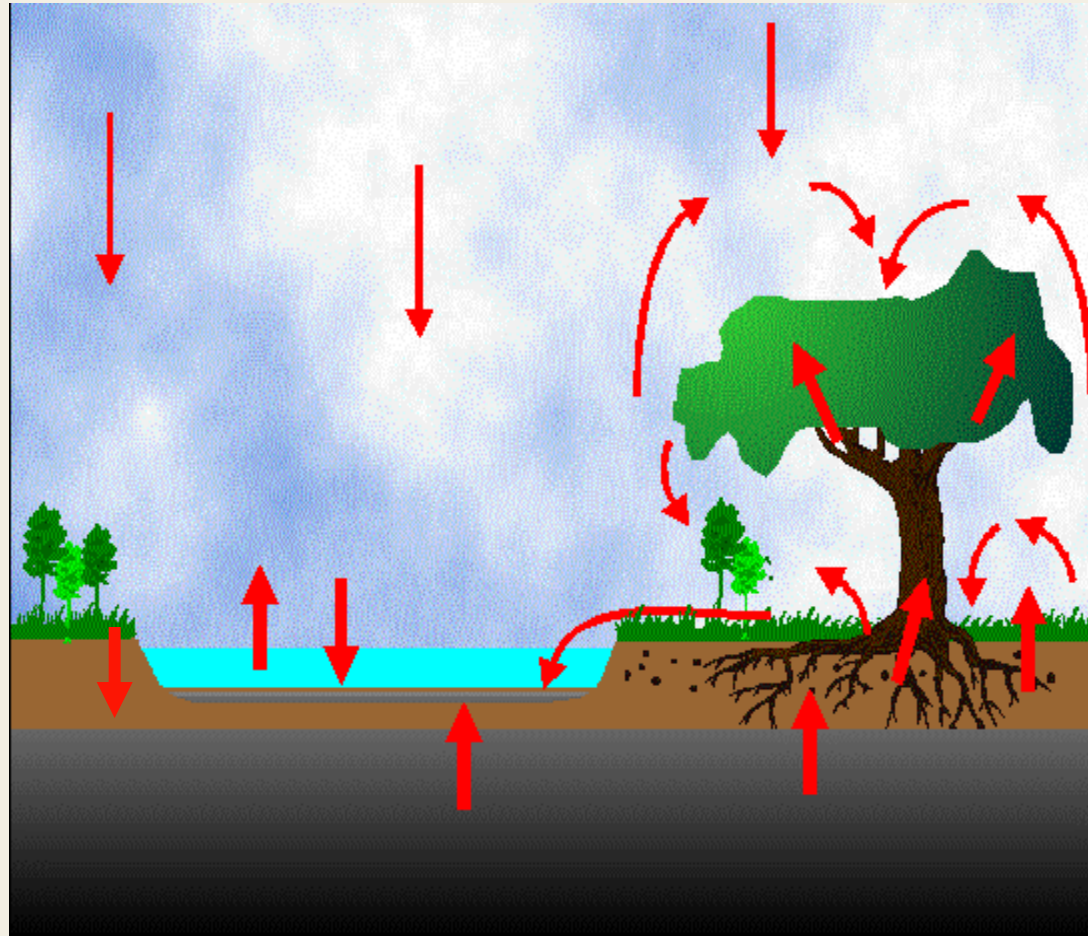




Biogeochemical Variation

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There is element cycling through the different media in nature



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Biogeochemical Variation

Sample **Media** for Geochemistry



Groundwater



Tree Rings

Vegetation



Lake sediments/water



**Soil, till and
rock**



Snow and ice



Stream sediments/water



Natural foods



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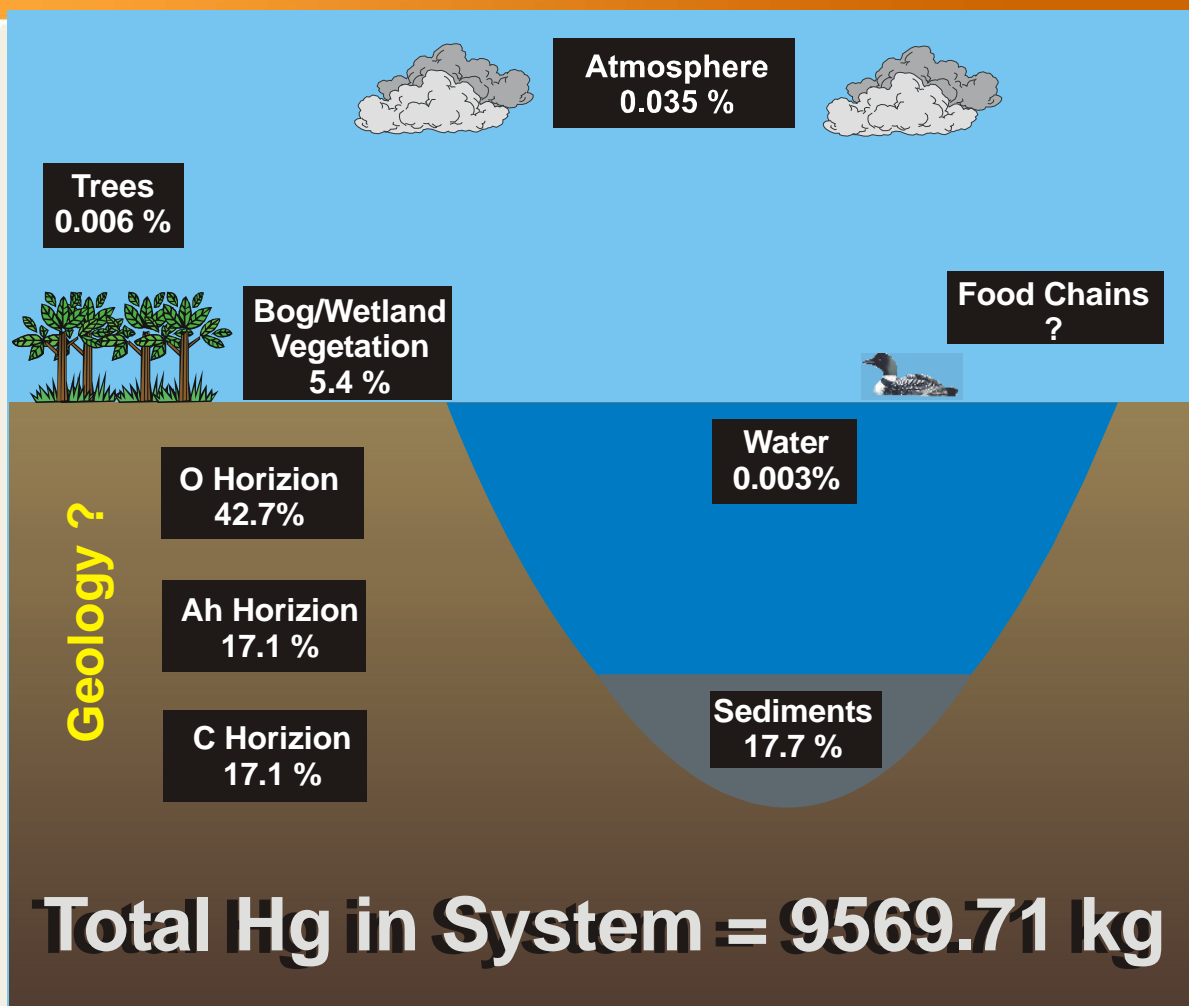
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Source: O'Driscoll et al., 2005



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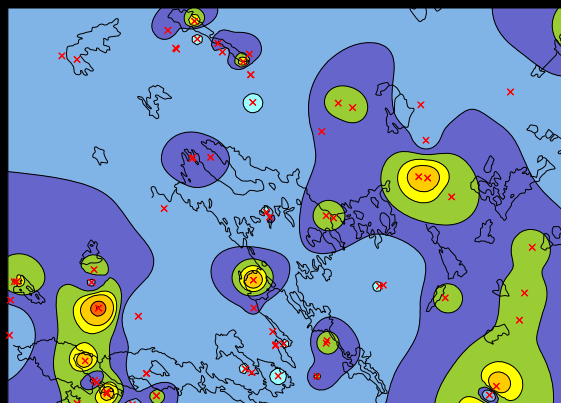
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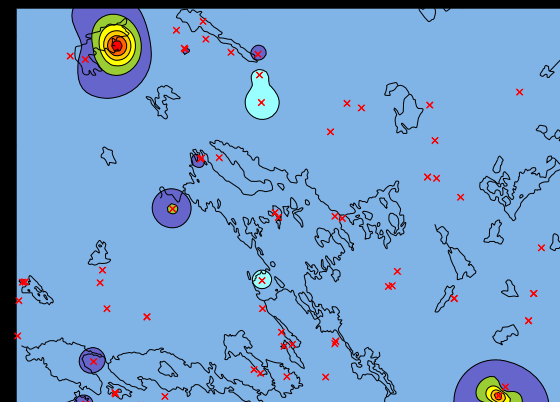
Mercury in Kejimikujik Park, NS

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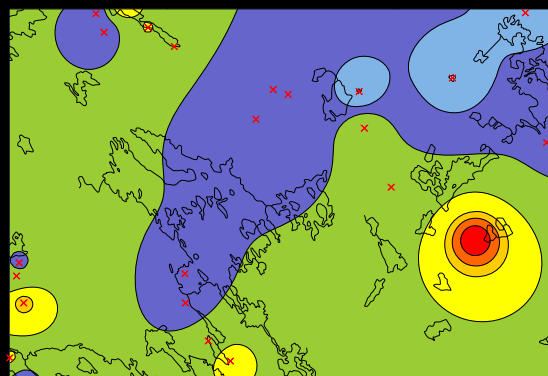


50
ppm

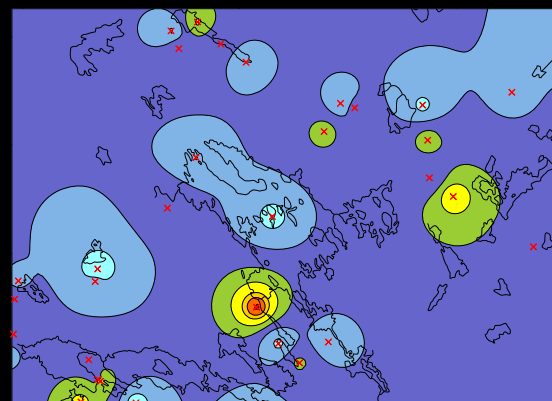
Sugar Maple



White Pine



200
ppb



O Horizon

(from Rencz et al. 2003)

C Horizon <63um



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Correlations
between Hg in perch
and vegetation and
surficial media
(Rencz et al. 2003)

Pearson Correlations

- two-tailed normal distribution
- Significant at the 0.05 and 0.01 levels

			Perch	Water				
			Hg	Hg total	MeHg	Hg0	DOC	
Water	Fish	Perch	-	-	-	-	-	
	Chemistry	DOC	.417*	.868**	.703**		-	
		Hg total	.558*	-	.723**		.868**	
		MeHg	.556*	.723**	-		.703**	
		Hg0						
Vegetation	Red Maple	Hg						
		P	.670**	.687*	.542*		.654**	
	White Pine	Hg					.500*	
		P	.540*					
	Tree Lichen	Hg						
		Au	-.580*					
Humus	<.177 mm	Hg						
		Au						
		P						
Ah Horizon	<.177 mm	Hg						
		Au						
		P			.562*			
	<.063 mm	Hg						
		Au						
		P			.767**			
C Horizon	<.177 mm	Hg		.755*	.575*		.720**	
		Au						
		P		.769**	.775**		.784**	
	<.063 mm	Hg						
		Au						
		P		.668*	.778**		.662**	



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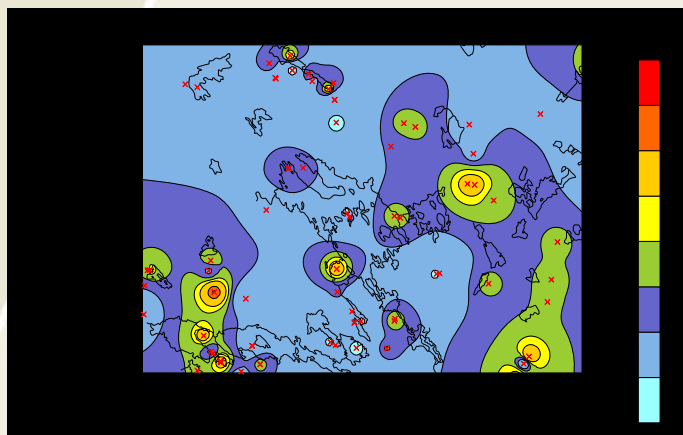
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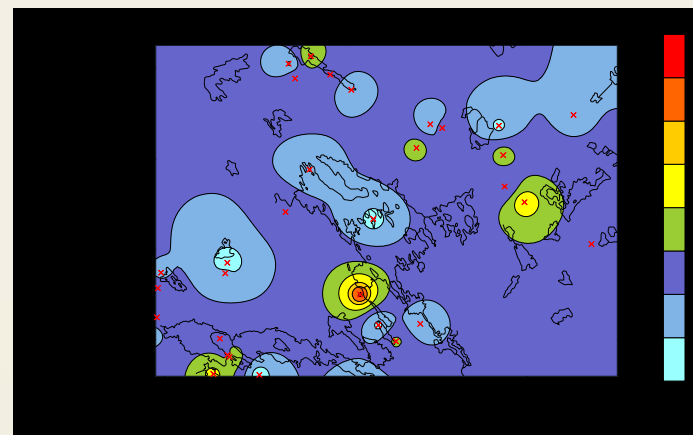


Biogeochemical Variation

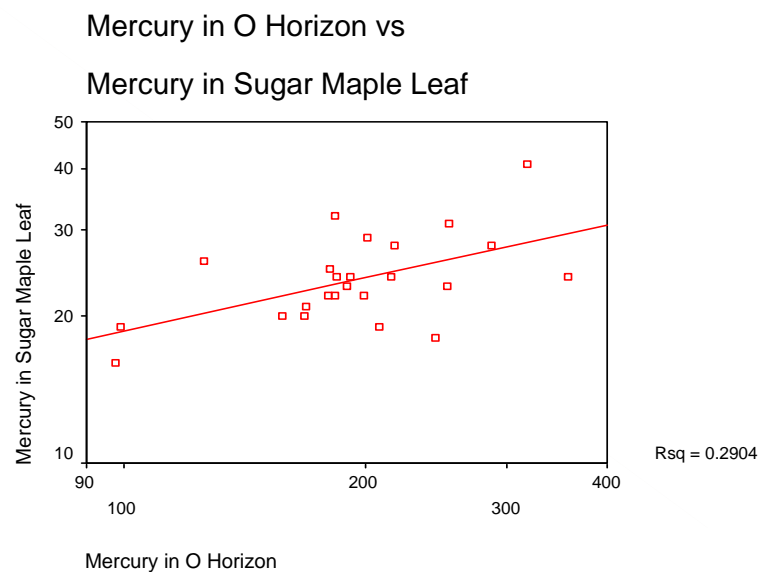
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Mercury in Sugar Maple



Mercury in C Horizon <63um



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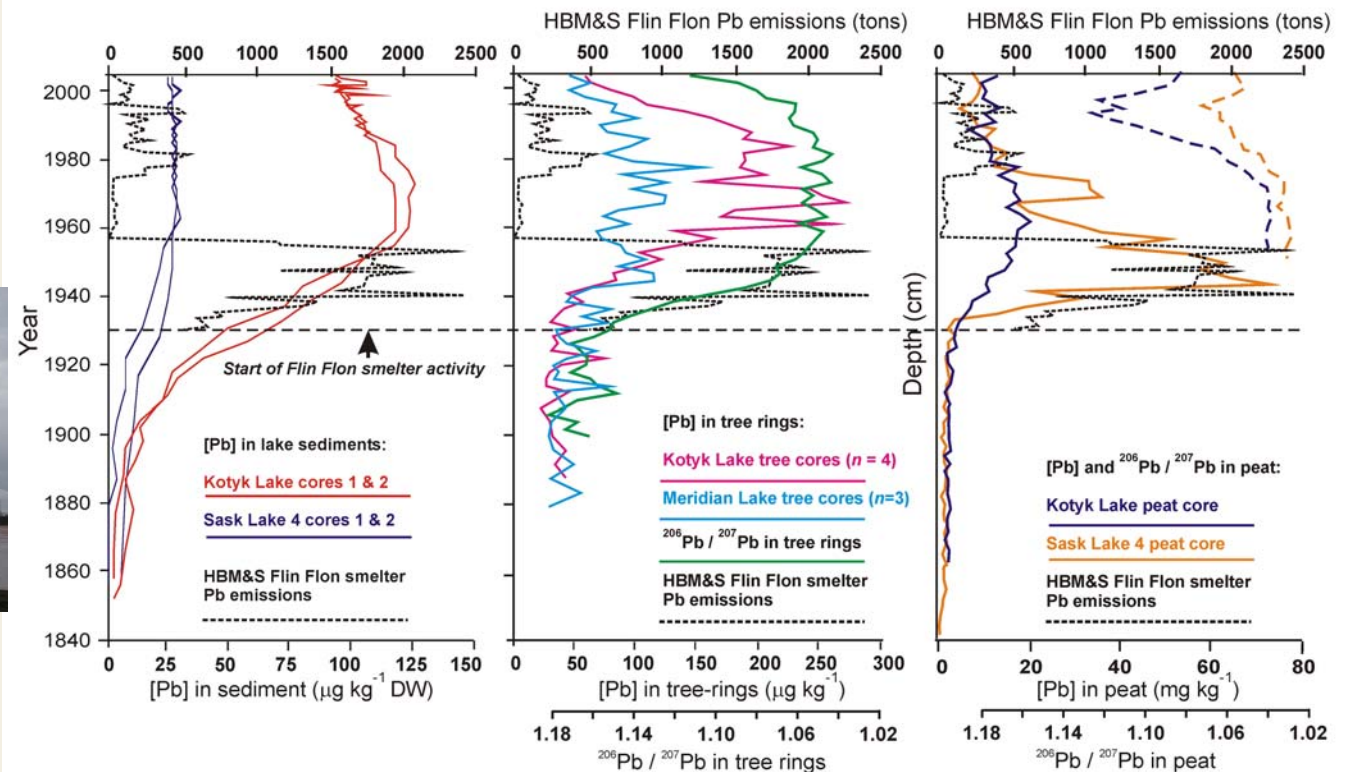
The chemical characteristics of the various sample media may vary with time.

- Comparison of the distribution of Pb in sediment, tree rings and peat.

From Savard et al., 2006



Smelter at Flin Flon, Manitoba



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Summary:

- There are relationships between patterns of concentration levels in various sample media within an ecosystem.
- There may be orders of magnitude of difference in concentration levels between the various media.
- Soils occur in most places and have no significant seasonal affects.
- Soils are a “direct” path to the biological system.



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References

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