

TITLE: The distribution of mercury in a forest floor transect

LOCATION: Northern and Interior West FIA Regions

DURATION: Year 3 of 3-year project **FUNDING SOURCE:** Fire Plan

PROJECT LEADER:

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PROJECT OBJECTIVES:

A spatial model of the mass of forest floor mercury will be constructed along a transect spanning the northern coterminous United States. This proposal summarizes work on the 2001-2004 data and requests funding to complete the analysis and share the results.

JUSTIFICATION:

a. Linkage to FHM Detection Monitoring

Support from the Evaluation Monitoring (EM) component of Forest Health Monitoring (FHM) is needed because current FIA Phase 3 sampling of soils does not include analysis for mercury.

b. Significance in terms of the geographic scale

A transect across the northern coterminous United States was selected for two major reasons: 1) the investigators have relatively easy access to data in these data; the two soils Indicator Advisors are located in the Northern and Interior West regions, and 2) much of the deposition of mercury is believed to be related to industrial emissions which generally flow into the Northern region. The Interior West region should be relatively unaffected.

c. Biological impact and/or political importance of the issue related to fire

Forest fires release mercury into the atmosphere when the forest floor is consumed while mercury concentration in the mineral soil may be unaffected (Amirbahman and others 2004). As industrial emissions come under increasing regulation, the contribution of forest fire to the mercury budget is an increasingly significant unknown.

d. Feasibility that the project will be successfully completed within 1-3 years

New data collection is not required. Forest floor samples are collected as part of the Phase 3 sampling scheme. This project will fund finishing the analysis of extracted forest floor samples and presentation of the results at national meetings.

DESCRIPTION:

a. Background:

Upland soils are sinks for mercury (Grigal and others 2000; Kolka and others 2001); some of these sink properties may be due to storage or volatilization (Grigal and others 2000; Kolka and others 2001). Climatic factors influencing microbial activity may also increase retention (Fleck and others 1999).

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b. Methods:

Samples of the forest floor are collected as part of Phase 3 sampling in the FIA program.

These samples are analyzed for a suite of nutrients and other properties (e.g., total carbon, nitrogen, soil pH). Once the laboratory analysis is complete, the forest floor samples are stabilized and archived in the Grand Rapids lab.

Using funds from the last two fiscal years, we have removed a small part of the archived sample (< 0.5g) and are nearly done with our analysis of the mercury concentration. This data is being combined with the total mass and depth of the forest floor to estimate the mass of mercury stored in the forest floor.

c. Products:

The major product will be a spatial model and map of forest floor mercury for a transect across the northern coterminous United States.

d. Schedule of Activities for FY07

Fall & Winter 2006-07	Finish laboratory analysis for mercury
Winter & Spring 2007	Create spatial models of mercury storage and prepare posters
Spring & Summer 2007	Prepare publications

e. Progress/Accomplishments

A copy of our original timeline is included for review purposes.

Fall & Winter 2004-05	Obtain 2001-2002 samples
Spring, Summer, Fall, Winter 2005-06	Laboratory analysis for mercury
Spring & Summer 2006	Prepare posters
Fall 2006	Obtain 2003-2004 samples
Spring, Summer, Fall, Winter 2006-07	Laboratory analysis for mercury
Winter & Spring 2007	Create spatial models of mercury storage
Spring & Summer 2007	Prepare posters and publications

We identified samples from the 2001-2004 panels across two FIA regions: Northern and Intermountain West. Samples were identified for three different purposes. First, one subplot was sampled from each plot to define regional variation. Second, every subplot was sampled on 20% of the plots to define within-plot variation. Third, a duplicate 5% sample was removed for QA / QC purposes.

Soil archivists removed a small fraction from each sample (< 0.5g) and mailed them to three different laboratories for analysis. We are using three labs for QA / QC purposes. Complete laboratory results are expected in late 2006/early 2007.

A poster was shared at the FHM meeting in Charleston, SC, and new, updated information will be shared at the Soil Science Society of America meeting and the FIA Science Symposium.

COSTS:

The budget supports finishing the analysis on the 2003-2004 plots in the Intermountain and Northern regions. USGS assisted with the 2001-2002 samples, but they currently have no support for this year.

Funding is also allocated for travel, so the results can be shared with the scientific community.

	Item	Requested FHM EM Funding	Other- Source Funding	Source
Administration	Salary	0	0	
	Overhead	0	0	
	Travel	5 000	0	
Procurements	Contracting	20 000	0	
	Equipment	0	0	
	Supplies	0	0	
	Total	25 000	0	

REFERENCES:

- Amirbahman A, Ruck PL, Fernandez IJ, Haines TA, Kahl JS. 2004. The effect of fire on mercury cycling in the soils of forested watersheds: Acadia National Park, Maine, U.S.A. *Water, Air, and Soil Pollution* 152(1-4):313-331.
- Fleck JA, Grigal DF, Nater EA. 1999. Mercury uptake by trees: an observational experiment. *Water, Air, and Soil Pollution* 115(1-4):513-523.
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- Kolka RK, Grigal DF, Nater EA, Verry ES. 2001. Hydrologic cycling of mercury and organic carbon in a forested upland-bog watershed. *Soil Science Society of America Journal* 65(3):897-905.