Approved: January 22, 2009
Date

MINUTES OF THE SENATE NATURAL RESOURCES

The meeting was called to order by Chairman Carolyn McGinn at 8:30 a.m on January 16, 2009 in Room 446-N of the Capitol.

All members were present except:
Senator Steve Morris- excused
Senator Terry Bruce- excused

Committee staff present:
Alissa Vogel, Administrative/Committee Assistant
Corey Carnahan, Kansas Legislative Research Department
Raney Gilliland, Kansas Legislative Research Department
Jason Thompson, Revisor of Statues Office

Conferees appearing before the committee:
Chris Tymeson, Chief Legal Counsel, Kansas Department of Wildlife and Parks
Rick Brunetti, Director of the Bureau of Air and Radiation, Kansas Department of Health and Environment
Tom Gross, Section Chief, Kansas Department of Health and Environment

Others attending:
See attached list.

Senator McGinn welcomed Committee members to the first meeting of 2009 and introduced new committee members: Senator Morris, Senator Abrams and Senator Pilcher-Cook. Staff members that were introduced include : Alissa Vogel, Committee Assistant; Corey Carnahan, Legislative Research; Raney Gilliland, Legislative Research; and Jason Thompson, Revisor of Statutes Office. Senator Francisco introduced her intern, Meghan Walsh, from the University of Kansas School of Law. Senator McGinn discussed rules for the Committee including: meetings will begin as close to 8:30 as possible and committee members were asked to inform the Committee Assistant when they will be absent prior to the Committee meeting in order to be counted as excused.

Chris Tymeson, Chief Legal Counsel from the Kansas Department of Wildlife and Parks, requested a bill introduction regarding wearing blaze orange during deer and elk seasons. He proposed a small modification to a subsection of K.S.A. 32-1015. A motion was made by Senator Taddiken to introduce the bill. Senator Francisco seconded the motion, and the motion carried.

Rick Brunetti, Director of the Bureau of Air and Radiation, provided Committee members with the 2009 Mercury Deposition Report, a requirement of K.S.A. 75-5673, pursuant to HB 2526 passed in 2007. He introduced technical staff member, Tom Gross, Section Chief of the Bureau of Air and Radiation, who presented a summary of the report and addressed questions Committee members had regarding the content of the report. The report included two packets: The Mercury Deposition Monitoring in Kansas: Implementation and Network Statues Report (Attachment 1) and its summarized PowerPoint version. (Attachment 2)

In compliance with the statute, a statewide atmospheric mercury deposition monitoring network was established, including six monitoring sites in the state of Kansas. Existing resources were used and contracts were made establishing site partners. The six sites include: Sac and Fox Nation of Missouri in Kansas and Nebraska, Glen Elder State Park in partnership with KDWP, Lake Scott State Park in partnership with KDWP and a private contract operator, Cimarron National Grassland in partnership with USDA, Big Brutus, Inc. in partnership with Big Brutus Board and Coffey County Lake in partnership with Wolf Creek and KDHE. At least two of the sites are considered background sites, measuring mercury deposition entering the state from prevailing winds. In placing monitoring sites, sources of mercury emissions were targeted, specifically power plants and cement kilns.

MINUTES OF THE Senate Natural Resources at 8:30 a.m. on January 16, 2009, in Room 446-N of the Capitol.

As required by statute, a contract was made with a proven laboratory capable of appropriate analysis; Illinois State Water Survey, the official laboratory of the National Mercury Deposition Network.

The first group of mercury data results are now available online.

Data presented before the Committee is preliminary data and official results will be given after a six-month period. Data is undergoing an extensive analytical and data quality assurance process, that may invalidate some preliminary results.

Nationwide, there are over 100 mercury deposition monitoring sites. All six sites in Kansas are part of the National Mercury Deposition Network, designed to study and quantify atmospheric fate and deposition of mercury. The importance of participating in the National Mercury Deposition Network was emphasized, as atmospheric mercury deposition is affected by both anthropogenic and naturally occurring sources found at local, regional, and global level.

A summary of the Kansas Mercury Deposition Network (KMDN) budget is as follows: network development from June 1, 2007-Dec. 31, 2008, $102,023; operating costs from Jan. 1, 2008-Dec. 31, 2008, $77,300; estimated total costs of 2009 and the first full year of operation, $141,821. This year's expense totaled over $100,000 as estimated in the projected costs two years ago. This does not include allowance for natural disasters such as lightening strikes. He estimated that another $20,000 might be a realistic additional estimate to account for equipment repair. He mentioned that efforts have been made to cut costs that include: using existing resources, contracting with local operators and use of localized rather than nationalized training.

Mr. Gross stood for questions. Discussion ensued regarding budget overruns, in which it was found that if adjustments were made to the program, it would not be in violation of any federal requirements and that KMDN is substantially under the budget projected in the fiscal note.

The Committee was informed that as a result of the EPA's loss on the Clean Air Mercury Rule and the Clean Air Act, referring to the enforcement of electrical generation facilities to monitor mercury emissions, Kansas is only in the beginning stages of mercury deposition monitoring. Further, mercury deposition data collection is necessary to understand national trends and the impact local sources have on atmospheric mercury deposition.

The use of fish tissue to monitor mercury deposition also was discussed and compared its accuracy to that of air monitoring. The Committee was informed that both methods are useful. However, there is the need to evaluate the usefulness of both methods.

The next meeting is scheduled for January 22, 2009.

The meeting was adjourned at 9:24 a.m.

SENATE NATURAL RESOURCES COMMITTEE

Guest Roster

1/16/09
(Date)

Michelle Butler	Capitol Strategies
Tessie Kaufman	KS Coop Council
Joe Mosimann	Hein Law Firm
Lindsey Douglas	KDA
Shari Albrecht	KDHE
Mark Schreiber	Westar Energy
Chris Tymeson	KDWP
Rick Brunetti	KDHE
Tom Gross	KDHE
STEVE FROST	SCC
Dave Holthaus	KEC
Katelyn Lutgen	KGC

Please use black ink only!!

Mercury Deposition Monitoring in Kansas: Implementation and Network Status Report

Our Vision – Healthier Kansans living in safe and sustainable environments.

December 31, 2008

Kansas Department of Health and Environment
Bureau of Air and Radiation
1000 SW Jackson – Suite 310
Topeka, KS 66612-1366

Rick Brunetti
Senate Natural Resources
January 16, 2009
Attachment #1

Mercury Deposition Monitoring in Kansas: Implementation and Network Status Report

Table of Contents

Mercury Deposition Monitoring in Kansas: Implementation and Network Status Report

Summary of Mercury Deposition Network Development and Monitoring

Introduction

KSA 75-5673 requires that the Kansas Department of Health and Environment (KDHE) establish a statewide mercury deposition network consisting of at least six monitoring sites. Monitoring for a period of time long enough to determine trends (five or more years) is also specified.

The network has been designed to assure compatibility with the national Mercury Deposition Network (MDN). The MDN, coordinated through the National Atmospheric Deposition Program (NADP), is designed to study and quantify the atmospheric fate and deposition of mercury. The MDN collects weekly samples of wet deposition (rain and snow) for analysis to determine total mercury.

Sampling at all sites is performed on a weekly basis, with sample retrieval every Tuesday. Clean sample glassware is installed for collection of the next week's sample at the time of the operator's site visit. All samples are sent to a national contract laboratory utilized by the MDN. Sample analysis and coordination through this national cooperative research program are performed under contract.

Preliminary site evaluation began upon signing of the legislation. Equipment was bid, selected and purchased at the time the site selection process was initiated.

Kansas Mercury Deposition Network Siting Process

The steps required to select and develop a site and subsequently initiate mercury wet deposition sampling can be separated into four phases: site selection; site development; operator training; and routine operation. The time required for each site to become operational varies. Each site requires a contract, use permit and/or easement to document permission for use of the site, and several contracts also address operation of the sites. Some steps are conducted simultaneously, while others must occur independently at a particular point in the process.

1. Site Selection. The following steps must be completed to select a site for placement of mercury wet deposition sampling equipment:

- Select potential sites for each region using a map
- Conduct scouting trips for preliminary evaluation of sites in each region
- Reduce list of sites to only those which will meet national network siting criteria
- Locate land/property owner or entity controlling access to site
- Select final site
- Obtain any necessary permits and/or easements
- Negotiate site use agreement with appropriate authorities
- Conduct official candidate site review
- Submit site review documentation to Network Coordinator at Illinois State Water Survey for final approval
- Upon official approval, add site to MDN contract
- Locate interested operator candidates
- Interview and select operator(s)
- Negotiate operator contract

2. Site Development. Site development must be completed prior to operator training. The following steps must be completed to prepare a site for mercury wet deposition sampling:

- Set the mounting post for the MDN sampler and platform for rain gauge
- Install electrical service at site (via independent electrical contractor)
- Install sampler and rain gauge
- Conduct operational tests of sampler and rain gauge
- Configure and test hand-held electronic communications device with rain gauge data logger

3. Operator Training. Each site has at least one operator who must be properly trained in site operation and sampling handling procedures. The first training session, at Reserve, KS, was conducted by personnel from the national MDN program. All subsequent operator training sessions have been conducted by KDHE personnel. Operator training must be completed prior to initiation of sampling. The following steps are necessary for an on-site operator training session:

- Select date for operator training session
- Conduct on-site operator training
- Install software drivers on operator computer and synchronize with hand-held electronic communications device

4. Routine Operation. Routine site operation is initiated as soon as possible following the operator training session. This is usually on the day of training.

- Add site/operator to shipping list
- Initiate operation as soon as possible after operator training
- Provide ongoing network management, technical consultation, troubleshooting and repair for site

A timeline showing the development of the statewide network appears below in Table 1.

Table 1. Timeline for Development of the Kansas Mercury Deposition Monitoring Network

March 2007	Consultation w/ national MDN Coordinator Re: equipment, siting criteria and operation
May 19, 2007	Purchase requests for equipment submitted via BAR Fiscal Officer
May 2007	Initiated contact w/ potential host agencies Re: siting and contract operation of sites
May 29, 2007	Equipment out for bid
July 17, 2007	Equipment ordered
August 21, 2007	Initiated on-site evaluations for MDN sites
August 2007	Draft of contracts for host agencies (KDW&P, USDA, Sac & Fox Nation), operators and MDN
Aug./Sept. 2007	Delivery of equipment
Sept. 2007	MDN site evaluations submitted to MDN Coordinator
October 22, 2007	Sac & Fox site - Agreement signed
November 13,2007	Sac & Fox site - Install/training
December 4, 2007	MDN cooperative agreement signed
Dec. 2007/Jan. 2008	Receipt of sampling media
January 10, 2008	Glen Elder site - Agreement signed
March 14, 2008	Scott State Park site - Operator agreement signed
April 22, 2008	Glen Elder site – Install/ Configure samplers
May 20, 2008	Glen Elder site – Training for operators/Site operating
June 3, 2008	Scott State Park site – Install/configure samplers
June 4, 2008	Scott State Park site – Training for operator/Site operating
August 21, 2008	Big Brutus site – Agreement signed
October 2, 2008	Big Brutus site – Install/configure samplers
October 7, 2008	Big Brutus site – Training for operators/Site operating
October 28, 2008	Coffey Co. Lake (Wolf Creek) site - Easement obtained
November 2008	Ongoing negotiation with USDA Forest Service Re: Cimarron Nat'l. Grassland site use agreement
December 16, 2008	Cimarron National Grassland – Install/configure samplers
December 17, 2008	Cimarron National Grassland – Training for operators
December 22, 2008	Coffey Co. Lake – Install/configure samplers; training for operators
December 30, 2008	Cimarron Nat'l. Grassland & Coffey Co. Lake sites operating

Description of the Kansas Mercury Wet Deposition Network

The complete Kansas Mercury Wet Deposition Monitoring Network (KMDN) consists of six sites distributed across the state. The locations of existing and future sites in the states of Nebraska and Oklahoma were also taken into consideration to optimize regional mercury network coverage. A map of the network appears below in Figure 1.

Figure 1. Kansas Mercury Deposition Network and sites in Nebraska and Oklahoma

The first operational site in the network is at Reserve, KS. This site is located at an existing ambient air monitoring station belonging to and operated by the Sac and Fox Nation of Missouri in Kansas and Nebraska. The Tribe's environmental department is operating the sampler under contract with KDHE. A photograph of the site at Reserve is included below as Figure 2.

Figure 2. Kansas Mercury Deposition Sampling Site KS03, Reserve, KS

In Figure 2, the white cylinder to the left is a digital rain gauge. The operator is opening the mercury deposition sampler. The building houses visibility monitoring equipment (i.e., an IMPROVE-protocol sampler), and the tower supports meteorological monitoring instruments, which are operated by the Tribe's environmental department. Only the rain gauge and mercury deposition sampler are owned by the State of Kansas.

The Kansas Department of Wildlife and Parks (KDWP) hosts two sites. The second site to become operational is at Glen Elder State Park, between Glen Elder and Cawker City, KS. This site is operated by KDWP personnel. The third operational site, located north of Scott City, KS, at Scott State Park, is operated by an independent contract operator.

The fourth KMDN site is located near West Mineral, KS, at the Big Brutus Museum. This site is hosted and operated by Big Brutus, Inc.

The fifth site in the network is located at Coffey County Lake (Wolf Creek). This site is operated by KDHE ambient air monitoring field staff.

The United States Department of Agriculture hosts the sixth site, which is located at the Cimarron National Grassland near Elkhart, KS. This site is operated by personnel at the Cimarron National Grassland.

Each site was chosen to meet particular criteria. Specific regional and local siting criteria must be met before any site is accepted into the national MDN. A major consideration, at both the state and national levels, was relatively even distribution of monitoring sites across Kansas. Some other considerations, especially of interest from the State's perspective, were distance and direction to potential sources of airborne mercury, proximity to fish tissue monitoring locations, and distance to neighboring state boundaries. Mercury deposition sampling locations in the States of Oklahoma and Nebraska also affected placement of samplers in the network.

Specific information about the sampling sites appears below in Table 2. As used in Table 2, the term "downwind" refers to the location of a monitor relative to a potential mercury source with regard to prevailing winds during the late spring, summer and early fall months. In most locations across Kansas, this would mean that a monitor is located to the north or northeast of a source.

Table 2. Kansas Mercury Deposition Network Siting Information

MDN Site No.	Location	Reasons for Selection[a]	Initial Sampling Date
KS03	Sac and Fox Nation of Missouri Brown County Reserve, KS	♦ Downwind of NE KS sources (EGUs) ♦ Existing IMPROVE-protocol site ♦ Near Nebraska border ♦ Coordinated with Nebraska mercury monitors	2-Jan-08
KS04	Big Brutus, Inc. Cherokee County Near West Mineral, KS	♦ Proximity to "hot spot" on national MDN maps ♦ Downwind of sources (cement kilns) ♦ Near Missouri border ♦ Coordinated with Oklahoma mercury monitors	7-Oct-08
KS24	Glen Elder State Park Mitchell County Between Glen Elder and Cawker City, KS	♦ Fills gap in network ♦ Proximity to fish tissue sampling (alternate years) ♦ No urban influences ♦ Near Nebraska border ♦ Coordinated with Nebraska mercury monitors	20-May-08
KS32	Scott State Park Scott County North of Scott City, KS	♦ Existing NADP/NTN[b] site ♦ Downwind of source (EGU) ♦ Fills gap in network ♦ No urban influences ♦ Near Colorado border	4-Jun-08
KS99	Cimarron National Grassland Morton County Near Elkhart, KS	♦ Remote site ♦ No urban influences ♦ Near Oklahoma and Colorado borders ♦ Coordinated with Oklahoma mercury monitors	30-Dec-08
KS05	Coffey County (Wolf Creek) Lake Coffey County Near Burlington, KS	♦ Downwind of sources (cement kilns) ♦ Potential for fish tissue sampling ♦ No urban influences	30-Dec-08

[a]Spatial distribution of samplers throughout the network was a primary consideration for each site.
[b]NADP/NTN: National Atmospheric Deposition Network/National Trends Network

Network Cost Analysis

Costs associated with the KMDN are presented in Table 3 below. All costs are covered by Air Fee Fund revenues. This table is divided into a section for network development, and a section for the cost of the first year of operation. The costs associated with network development include all capital equipment purchases as well as site preparation costs. Costs associated with operation are relatively low for 2008 because sampling was phased in as development was completed and each site became operational. A much higher annual network operating cost is anticipated for 2009, when all six sites will be active.

Table 3. Kansas Mercury Wet Deposition Network Costs

Kansas Mercury Deposition Network Development Costs: June 1, 2007 – Dec. 31, 2008					
Cost Category	**Item Description**	**Cost Each**	**Qty.**	**Total Cost**	**Category Totals**
Salaries and Fringes				$35,537	**$35,537**
Equipment	MDN Collector	$4,748	6	$28,488	
	Digital Precipitation Gauge	$5,640	5	$28,200	
	Precipitation Gauge Windscreen	$640	1	$640	
	Communications Device (PDA)	$300	6	$1,800	
			Total Capital Equipment		**$59,128**
Training	On-site MDN Training	$1,400	1	$1,400	
				Total Training	**$1,400**
Site Development	Material	$300	6	$1,800	
	Travel (Average = $0.45/mile)	$0.45	6,996	$3,148	
	Installation of Electrical Service			$1,010	
				Total Site Development	**$5,958**
Total Network Development Cost					**$102,023**

Kansas Mercury Deposition Network Operating Costs: Jan. 1, 2008 – Dec. 31, 2008		
Cost Category	**Item Description**	**Category Totals**
Salaries and Fringes		**$28,909**
Supplies	Low toxicity antifreeze	**$230**
Operator and Site Use Fees		**$12,788**
Travel	Travel ($0.505/mile)	**$254**
Shipping	Samples to Laboratory	**$5,162**
Laboratory Analysis	Mercury Analysis	**$29,957**
Total Operating Cost		**$77,300**

National MDN Data

The purpose of the MDN is to collect mercury deposition data over a long period of time to monitor trends in the levels of mercury deposited over the earth's surface. Short term data analysis is difficult because of seasonal and year to year variability in precipitation amounts and mercury concentrations.

Quality assurance of MDN data occurs at two levels. All data are first reviewed by the national contract laboratory for completeness and accuracy, and assigned codes for samples that were mishandled, contaminated, or affected by equipment malfunction. The final laboratory data set is then forwarded to the national MDN Program Office for final quality assurance before generation of annual concentration and deposition maps and posting to the Web.

Data generated by the KMDN will be posted to the KDHE Web site as available and annually to a national database. Total mercury results are reported as:

1) Concentration, expressed in nanograms of mercury per liter (ng/L) of precipitation collected.

   This is the amount of mercury present in the precipitation collected by the sampler. Concentration measurements provide a long-term record of mercury levels in precipitation across the United States.

2) Total precipitation depth collected, expressed in millimeters (mm).

   This is the depth of snow or rain collected, which when multiplied by the concentration, gives total deposition of mercury to the surface. (See #3 below.)

3) Deposition, expressed in micrograms of mercury per square meter (ug/m^2).

   This is the amount of mercury deposited by precipitation on each square meter of ground at the sampling site. The deposition numbers are important because they provide estimates (weekly, monthly and annual) of the amount of mercury loaded onto the surface of the earth in the vicinity of each sampling site. It is a portion of this mercury which enters bodies of water and ultimately can enter the food chain through aquatic systems.

National mercury data are summarized for each year by calculating the annual values from each site and plotting the information on a national map. The most recent national average concentration and total deposition maps (for calendar year 2007) appear in Figures 3 and 4. The Kansas sites will begin to appear on the 2008 maps, which will be issued by September 2009. It is expected that all six Kansas sites will have collected enough data to appear on the 2009 maps, which are scheduled for publication by September 2010. A set of these MDN maps, dating back to 1998, can be found at http://nadp.sws.uiuc.edu/mdn/maps/ .

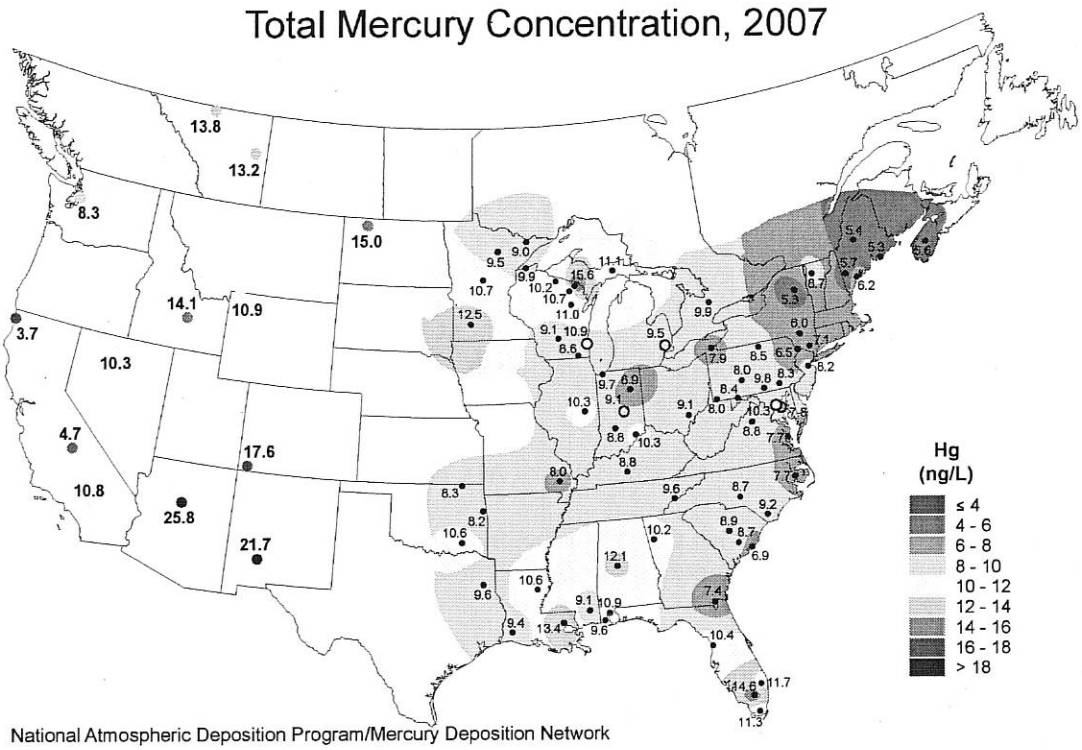

Figure 3. Total Mercury Concentration (ng/L), 2007

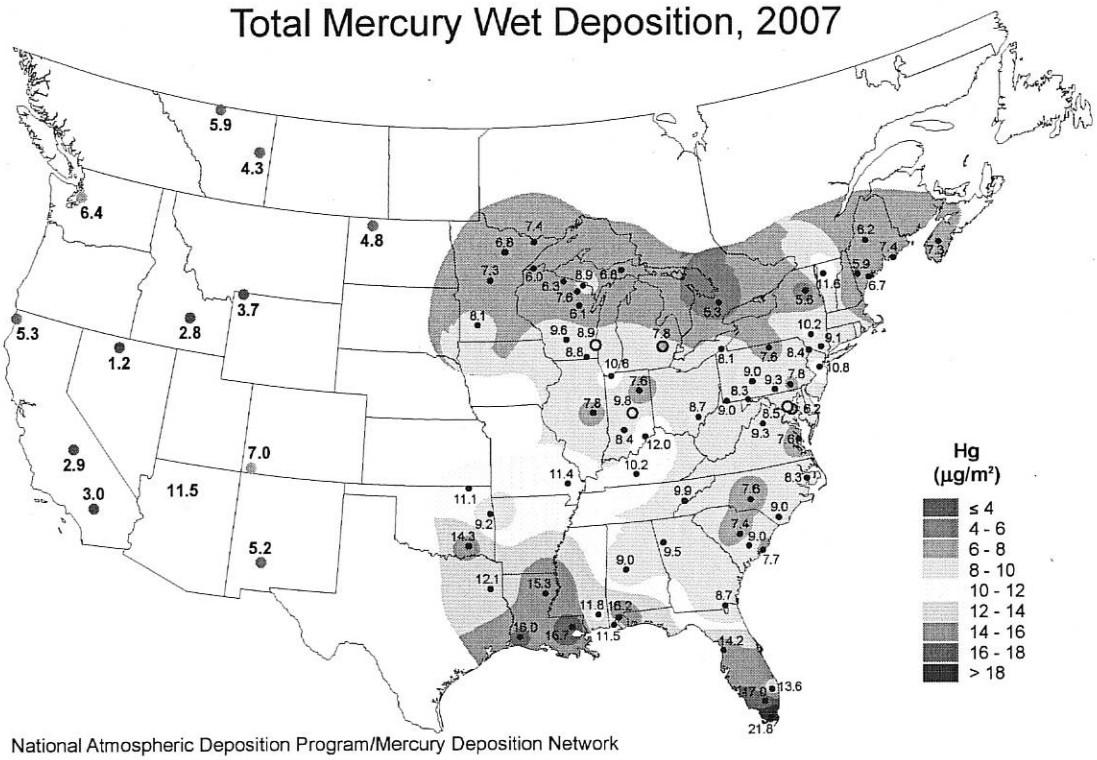

Figure 4. Total Mercury Wet Deposition (ug/m^2), 2007

Kansas Deposition Data for 2008

All currently available data from the KMDN appears below in Table 4. Preliminary data has been obtained through October 2008. The four sites that were operational before the end of October are included, with the data set for each site beginning with the first month of operation. These data sets have not been subjected to complete quality assurance procedures. The "raw" data may contain some values that could later be invalidated, but little change is expected and general conclusions can be made. The values shown are mercury deposition amounts expressed in ug/m^2 per month. The annual mercury deposition maps (example in Figure 4 above) will express mercury deposition as ug/m^2 per year. Monthly plots of mercury deposition at these sites in Kansas appear below as Figures 5 – 8.

Table 4. Kansas Mercury Wet Deposition Data (Preliminary): Jan. – Oct. 2008 (ug/m^2 per month)

Site	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
KS03	0.0357	0.1317	0.3431	1.2275	1.3771	2.9086	0.4117	0.2684	1.4127	0.7295		
KS24					1.8115	1.3353	1.5015	1.4677	0.5741	0.7202		
KS32						0.6556	1.2629	0.8322	0.3574	0.6367		
KS04										0.3864		

Seasonal variability is evident in the graph of data from the Reserve, KS, site (KS03; Sac and Fox Nation) presented in Figure 5a. This graph shows monthly mercury deposition and monthly precipitation totals. It can be seen that the months during which higher deposition values occurred were also months in which precipitation amounts were higher.

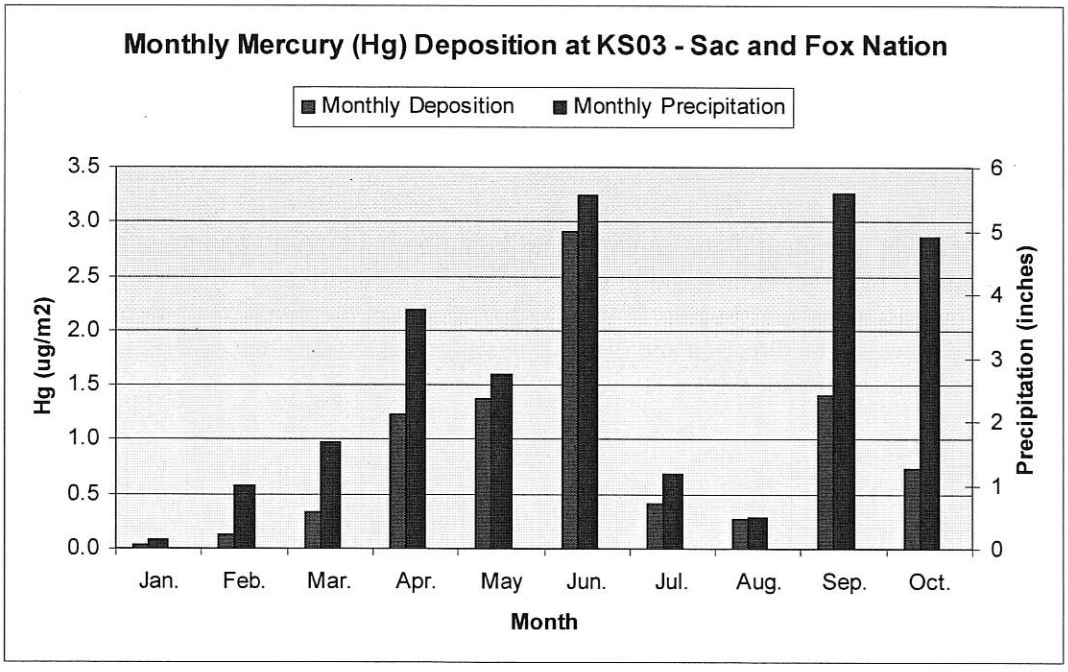

Figure 5a. 2008 Monthly Hg Deposition and Precipitation at KS03 – Sac and Fox Nation

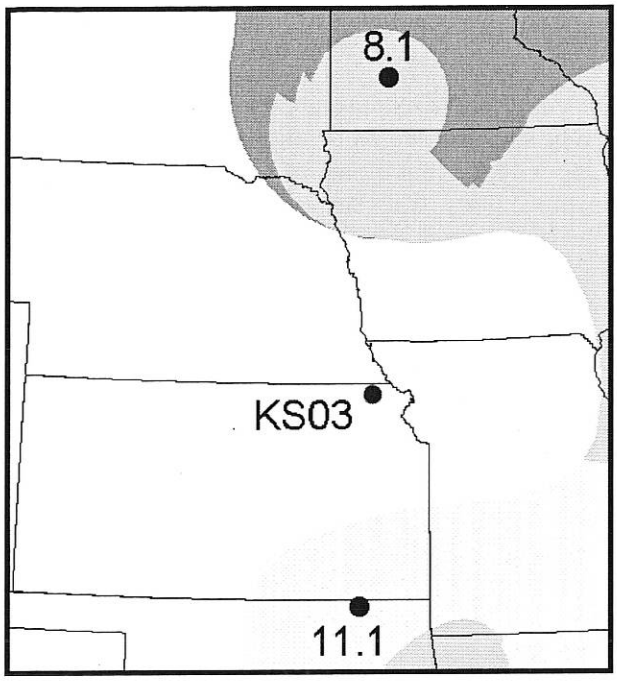

Figure 5b. Location of KS03 Relative to Nearest 2007 MDN Map Sites in Oklahoma and Minnesota

Figure 5b. above shows the location of KS03 at Reserve, KS, in relation to the nearest samplers to the north and south. Based on last year's values from the Oklahoma and Minnesota monitors, the interpolated value for KS03 would be about 10.5 ug/m^2. Based on the first ten months of data from KS03, the estimated value for 2008 is 10.6 ug/m^2. While this involves data from two different years, and each value is mathematically estimated, it serves as an indication that KS03 occupies a good position for filling a gap in the national network.

Less seasonal variation is evident in the graph of data from the site at Glen Elder State Park (KS24) presented in Figure 6. In this case, deposition values do not consistently vary with precipitation amounts. This difference in seasonality may be due, in part, to differences in precipitation patterns and amounts from site to site across Kansas. The direction and distance to various emission sources with regard to prevailing winds may also play a significant role.

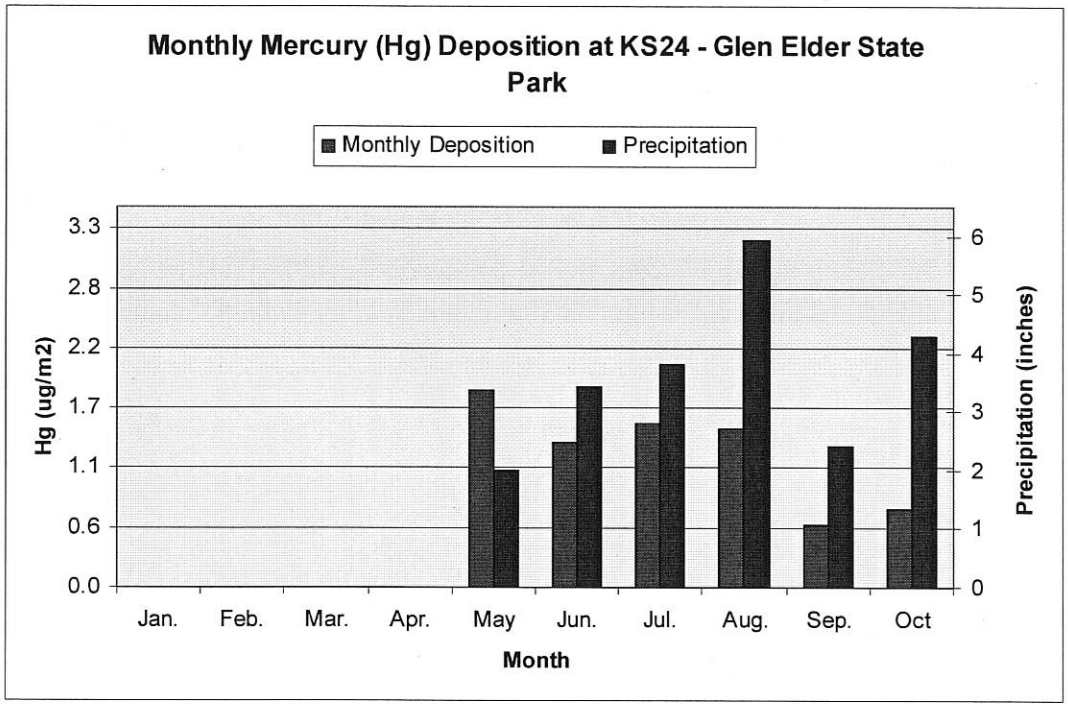

Figure 6. 2008 Monthly Hg Deposition and Precipitation at KS24 – Glen Elder State Park

A seasonal pattern related to precipitation is evident in the graph of data from the Scott State Park site (KS32) presented in Figure 7.

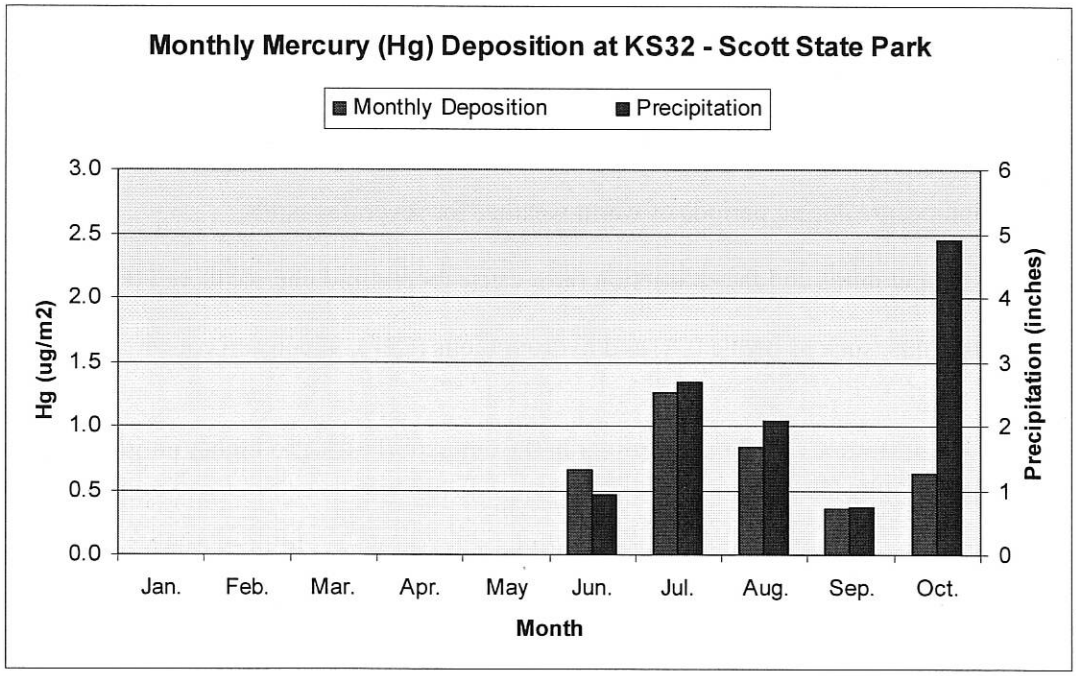

Figure 7. 2008 Monthly Hg Deposition and Precipitation at KS32 – Scott State Park

Only one month of data from the Big Brutus site (KS04) is presented in Figure 8 because operation of the sampler was initiated on October 7, 2008. The amount of data presented is too small to analyze.

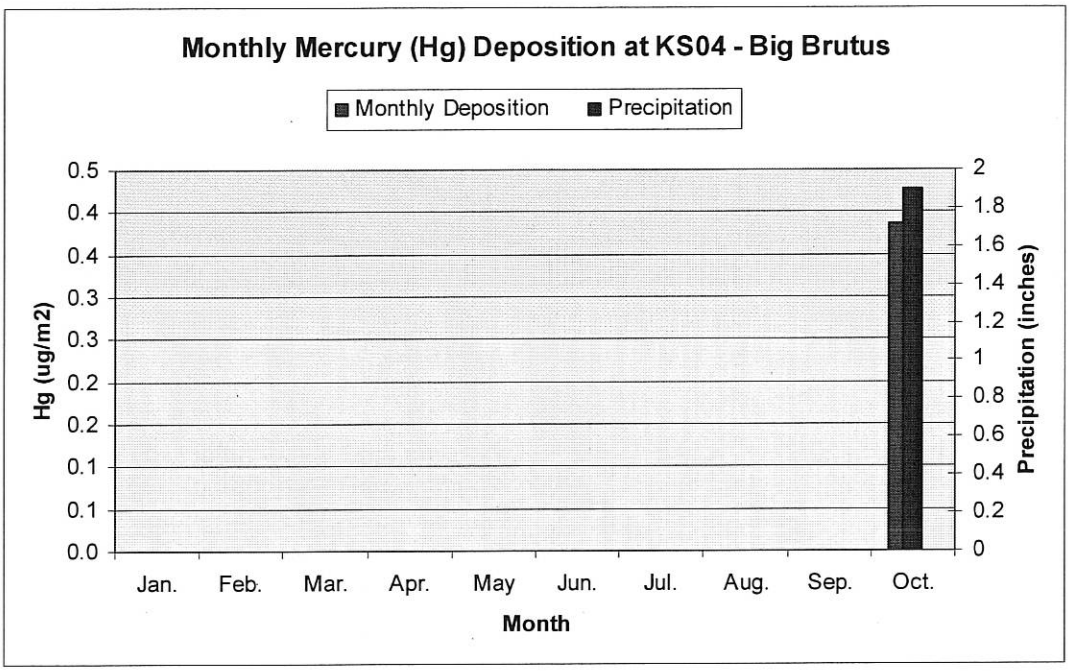

Figure 8. 2008 Monthly Hg Deposition and Precipitation at KS04 – Big Brutus

Discussion of Factors Affecting Mercury Deposition

Most mercury in the atmosphere is present as elemental mercury (Hg^0). Some of this mercury is converted to reactive gaseous mercury (Hg^{2+}), which is the predominant form flushed from the atmosphere by precipitation. It is generally believed that most atmospheric Hg^{2+} is in the form of mercuric chloride ($HgCl_2$). In general, concentration and deposition amounts are higher during the warmer months.

Higher deposition occurs during periods of warm weather for several reasons:

1) Higher temperatures and faster reaction rates cause more rapid chemical conversion.

2) More oxidants, such as ozone (O_3) and hydroxyl ions (OH^-), which can convert Hg^0 to Hg^{2+}, are present.

3) Higher concentrations of Hg^0 are present in the atmosphere (due to higher emissions from increased power generation, etc.).

4) More precipitation generally occurs and flushes more mercury out of the air more efficiently.

5) The atmosphere contains more particulate matter (dust, etc.). Because some mercury is associated with the particles, and the particles are easily flushed from the atmosphere by rain, there is more mercury available to be flushed.

There are three factors which affect deposition of atmospheric mercury at any given location. These are:

1) **Concentration,** which is affected by local, regional and global sources.

   The total amount of mercury from non-local sources circulating freely in the Earth's atmosphere at any given time constitutes the "global pool" of mercury. It is estimated that 95 per cent of the global pool is Hg^0, and this mercury circulates for a period estimated at between 6 months to 2 years. Local contributions to mercury concentrations vary considerably across the planet and within the United States, depending upon the distance from the point of measurement to local and regional sources. Much of a local mercury contribution impacts local and/or regional deposition, especially if it is emitted in a reactive form (e.g., Hg^{2+}).

2) **Precipitation,** which removes mercury from the atmosphere.

   Precipitation essentially "flushes" mercury from the atmosphere. It is this mercury that is measured to determine our deposition data. In general, mercury concentrations appear to be higher when it begins to rain or snow, and lower at the end of a precipitation event. This is most evident during periods of prolonged precipitation (i.e., over a period of several hours to several days).

3) **Location** with regard to proximity of local sources.

   As stated above (Factor 1), local mercury concentrations vary considerably across the planet and within the United States, depending upon the distance from the point of measurement to local and regional sources. This factor also varies with wind direction, i.e., whether the sampling point is upwind or downwind of such sources at the time of sampling. In general, the closer a monitor is to a source, provided that it is downwind of that source, the higher the mercury concentration.

Atmospheric mercury concentrations also tend to be higher at positions near to and downwind of emitting sources. This is described as "local influence" with regard to higher mercury concentration and deposition measurements. These are the local contributions described above (under Factor 1) which impact local and/or regional deposition. Across Kansas, there can also be dramatic shifts in sources of the air coming in from out of state. For example, southeast Kansas is much more likely to receive tropical air from the south. Out west, flow is dominated by the flows from farther west (i.e., Pacific air, continental air, etc). This can exert a significant influence on what the atmosphere contains and what gets flushed out.

An example of the effects of local and regional influences can be seen on MDN maps in the case of sites in the State of Indiana, where one site (IN21) exhibits significantly higher deposition than the surrounding sites. A data history of this site appears below in Figure 9.

A HISTORY OF MERCURY DEPOSITION AT MDN SITE IN21

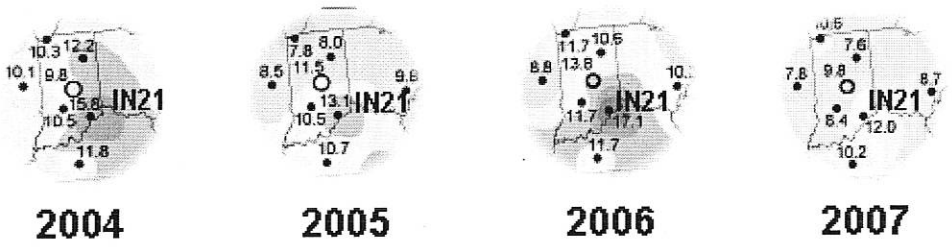

Figure 9. Mercury Deposition at MDN Site IN21

It is readily evident that the amount of mercury deposited annually at this site from 2004 through 2007 is higher than at the surrounding sites. This particular site is in the Ohio River valley, and occupies a position in the industrial heartland of the United States. Mercury deposition values tend to be at least 20-30 per cent higher at IN21 than at the surrounding sites.

A number of sources in Kansas also have a potential to affect mercury deposition at some of our sampling sites. These sources include electrical generating units, cement kilns and mining operations. The number of sources potentially contributing to local mercury deposition is certainly greater in the eastern half of Kansas. We do not yet have enough data to see whether effects of local and/or regional influences apply to Kansas in a manner similar to IN21, but this may become evident after several years of sampling.

Looking Ahead

Next year will represent the first full year of sampling across the entire KMDN. By the end of the year, 10 months of data will be available for each of the 6 sites. It is expected that all six Kansas sites will have collected enough data to appear on the 2009 national MDN maps, which are scheduled for publication by September 2010. After several years of data have accumulated, it should be possible to begin to evaluate trends in atmospheric mercury concentrations over Kansas. If certain sampling sites appear as "hot spots" with concentrations or deposition levels that are significantly higher than surrounding sites, possible contributing sources and atmospheric conditions will be evaluated.

Kansas Department of Health and Environment

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Mercury Wet Deposition Monitoring in Kansas

Report to the Senate Natural Resources Committee

Tom Gross **January 16, 2009**

Rick Brunetti
Senate Natural Resources
January 16, 2009
Attachment #2

This update is a requirement of K.S.A. 75-5673 pursuant to H.B. 2526 passed in 2007

- Requires KDHE to establish a statewide atmospheric mercury deposition monitoring network
- No fewer than six sites in Kansas
- At least two sites to measure mercury deposition entering the state from prevailing winds
- Contract with a proven laboratory capable of appropriate analysis
- Data and analysis reports shall be provided to the public via web site

Part of National Mercury Deposition Network

- All six sites in the national Mercury Deposition Network (MDN) for good comparability and QA
- Coordinated through the National Atmospheric Deposition Program (NADP)
- Designed to study and quantify atmospheric fate and deposition of mercury
- Weekly samples of wet deposition

Site Partners

- Sac and Fox Nation of Missouri in KS and NE
- Glen Elder State Park – KDWP
- Lake Scott State Park – KDWP/Private Contract Operator
- Cimarron National Grassland – USDA
- Big Brutus, Inc. – Big Brutus Board
- Coffey County Lake – Wolf Creek/KDHE

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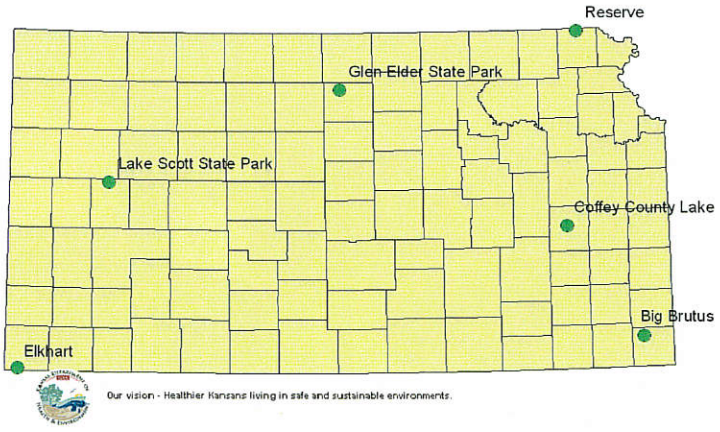
Kansas Mercury Sites

Mercury Wet Deposition Network



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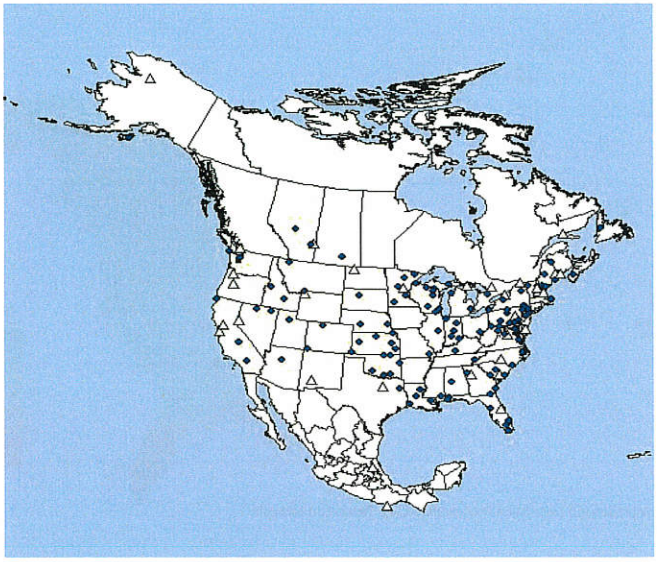
Automated Rain Gauge and Deposition Collector

Reserve, Kansas Site

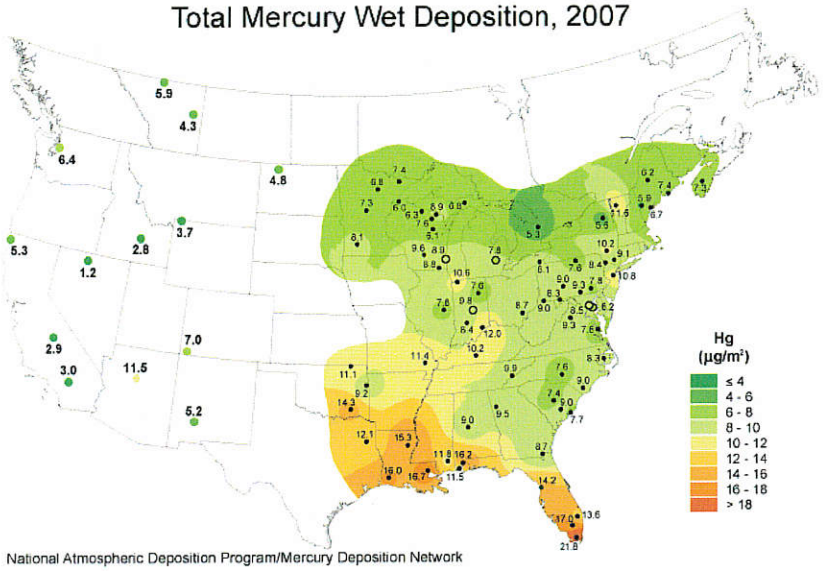
Current Active MDN Sites



Mercury Wet Deposition Data

- Concentration, expressed in nanograms per liter (ng/L) of precipitation collected. This is the amount of mercury present in the water collected by the sampler.
- Deposition, expressed in micrograms per square meter (ug/m^2). This is the amount of mercury deposited by precipitation on each square meter of ground at the sampling site.

Total Mercury Wet Deposition, 2007



National Atmospheric Deposition Program/Mercury Deposition Network

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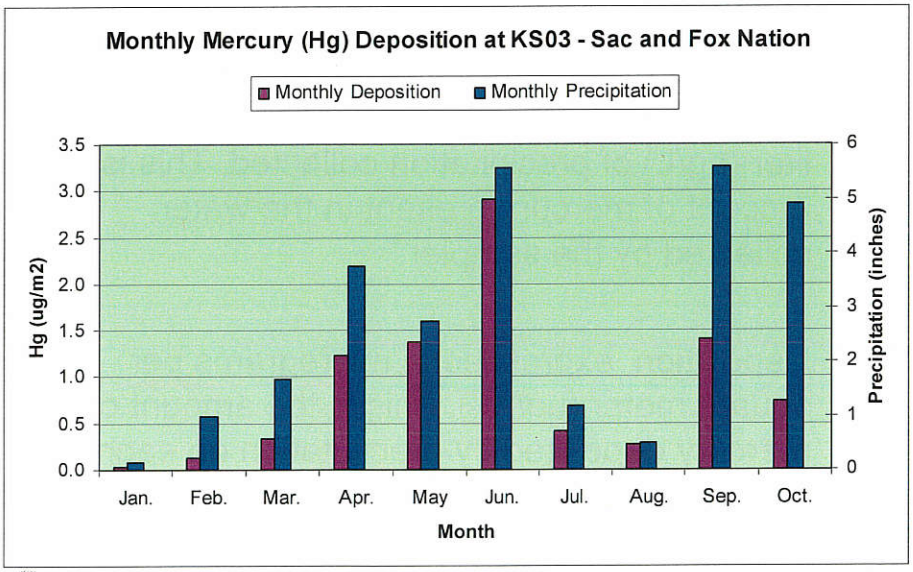
Seasonal variability in data from Reserve, KS.



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Factors Affecting Mercury Deposition

- **Atmospheric Concentration** is affected by local, regional and global sources
- **Precipitation** removes mercury from the atmosphere
- **Location** of monitor in relation to local sources

Mercury Network Siting Process

- Site selection
  - Find location meeting siting criteria
  - Locate owner, obtain permits, negotiate use agreement
  - Obtain national MDN approval, add to national contract
  - Find operator and negotiate contract
- Site development
  - Set post for sampler and platform for rain gauge
  - Install electrical service
  - Install equipment and conduct operational tests
- Operator training
  - Schedule and conduct operator training session
- Routine operation

KMDN Budget

- **Network development: June 1, 2007 – Dec. 31, 2008**
  - Salaries: $ 35,537
  - Equipment: $ 59,128
  - Training: $ 1,400
  - Site development: $ 5,958
  - Total: $ 102,023
- **Operating costs: Jan. 1, 2008 – Dec. 31, 2008**
  - Salaries: $ 28,909
  - Supplies & travel: $ 484
  - Operator & Site use fees: $ 12,788
  - Sample shipping: $ 5,162
  - Laboratory analysis: $ 29,957
  - Total: $ 77,300
- **Estimated total costs for 2009**
  - First full year of network operation: $141,821

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For more information…

Kansas MDN:

http://www.kdheks.gov/bar/air-monitor/mercury_monitoring.htm

National MDN:

http://nadp.sws.uiuc.edu/mdn/

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