

DEPARTMENT of the INTERIOR

news release

GEOLOGICAL SURVEY

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USGS COMPLETES NATIONWIDE RECONNAISSANCE OF METALS IN STREAMS

A report summarizing results of a nationwide reconnaissance of selected metals in the Nation's surface waters--particularly sources of water for metropolitan areas--has just been released by the U. S. Geological Survey, Department of the Interior.

Hydrologists of the Geological Survey, working in cooperation with the Bureau of Sport Fisheries and Wildlife, analyzed more than 720 water samples from urban and rural locations in all 50 States, Puerto Rico, and the District of Columbia for arsenic, cadmium, chromium (hexavalent), cobalt, lead, zinc, and mercury. The representative "raw water" samples were collected, each autumn during low streamflows characteristic of dry weather. Such flows concentrate all materials dissolved in the water, including these metals.

According to the report, small amounts of the seven metals are widely distributed in the streams and lakes of the United States.

Although much of the sampling was concentrated in and around the Nation's urban centers, where streams might be expected to receive metals from industrial and municipal waste treatment systems, there appears to be no widespread occurrence of these metals in streams and lakes in amounts exceeding current U.S. Public Health Service (PHS) drinking water standards (see Table No. 1 attached).

Only a few samples of the more than 720 collected contained heavy metal concentrations *in excess* of PHS standards for drinking water (as shown in Table No. 2 attached); 4 percent of the water samples contained cadmium concentrations over 10 micrograms per liter, and 2 percent of the samples contained arsenic over 50 micrograms per liter. A few samples contained lead and mercury concentrations in excess of 50 micrograms per liter and 5 micrograms per liter respectively. (One microgram per liter is equal to one part per billion, or one pound of metal in one billion pounds of water).

Dr. William Y. Focora, Director, U. S. Geological Survey, Washington, D.C., said that "the reconnaissance sampling was spurred by the growing need for data on the occurrence of certain minor elements in toxic quantities in the oceans and today's tap supply water to the Nation's cities and industries."

"In recent months," Pecora said, "we have received many requests for information on the natural and man-made concentrations of mercury in our waters; but the larger question has remained: Are there potentially dangerous concentrations of other elements present in our water resources? This first nationwide reconnaissance sampling was designed to provide at least a partial answer to that question."

He emphasized that the values obtained may not be typical of the sampling sites because concentrations of contaminants vary significantly from one sampling to another for a variety of reasons. He also pointed out that the concentrations of heavy metals attributable to natural sources have not yet been determined.

"With this and future sampling programs, we hope to establish a continuing baseline of information about the quality of our surface and ground waters to meet our responsibilities as appraisers of the Nation's water resources," the Survey spokesman said.

During the reconnaissance study, water samples were collected at three general types of locations:

- (1) from rivers and lakes that supply water to cities of more than 100,000 population or, in less urbanized States, to the largest city in the State;
- (2) from water courses downstream from major municipal and industrial complexes in each State; and
- (3) at the Geological Survey's hydrologic "benchmark" stations that were established in the mid-1950's to measure long-term trends in streamflow and water quality at sites far removed from man-made interferences.

Some of the results of the study:

MERCURY: Dissolved mercury ranged in concentration from below the limit of detection, 0.1 microgram per liter (1 microgram per liter is equal to 1 part per billion), to about 4 micrograms per liter, and was found in only 7 percent of the samples. None of the samples contained dissolved mercury in excess of the Public Health Service's proposed upper limit of 5 micrograms per liter. At a few sites, however, a combination of dissolved mercury and mercury attached to suspended particles gave concentrations that exceeded 5 micrograms per liter.

ARSENIC: About 21 percent of the samples contained detectable amounts of arsenic (less than 10 micrograms per liter), but only 2 percent of the samples exceeded the 50 micrograms per liter upper limit set by the Public Health Service. The largest concentration of arsenic - about 1,100 micrograms per liter - was found in Sugar Creek, near Mill Hill, S.C., downstream from a large industrial complex in North Carolina.

CADMIUM: About 42 percent of the samples contained cadmium in low concentrations ranging from 1 to 10 micrograms per liter, and 4 percent of the water samples contained cadmium in excess of the 10 micrograms per liter upper limit the PHS has set for drinking water.

LEAD: Concentrations of lead ranging from 1 to 50 micrograms per liter were found in about 63 percent of the samples, but only a few samples actually exceeded the 50 micrograms per liter PHS upper limit for drinking water.

CHROMIUM: Hexavalent chromium concentrations in the range of 5 to 50 micrograms per liter were detected in only 11 samples, less than 2 percent of all those collected. None of the river samples contained concentrations in excess of 50 micrograms per liter, the maximum level established by PHS for drinking water.

COBALT: Cobalt was found in about 37 percent of the samples, usually in the range of from 1 to 5 micrograms per liter. No maximum concentration limit has yet been set by PHS for cobalt in drinking water.

ZINC: Zinc is a fairly soluble metal, and concentrations range widely in river waters. It was detected most commonly in the range of 10 to 50 micrograms per liter, but occasionally exceeded 5,000 micrograms per liter, the recommended (but not mandatory) PHS upper limit for drinking water.

Pecora said that the various water samples "were analyzed with the help of newly-developed techniques. For example, we are now able to detect dissolved cadmium, cobalt, chromium, and lead concentrations as small as 1 part per billion (parts of water, using an absorption cell placed in the light beam of an atomic absorption spectrophotometer. Mercury is detected as low as 1 part in 2 billion parts of water."

"The special reconnaissance was made," Pecora explained, "through the district offices and laboratories maintained by the Geological Survey throughout the country that operate the Survey's National Water Data Network."

"The USGS," Pecora emphasized, "does not originate, regulate, or carry out pollution control programs; rather, it is the Survey's responsibility--through its National Network--to gather the basic hydrologic data needed by those who are attacking such problems."

The report, "Reconnaissance of Selected Minor Elements in Surface Waters of the United States," by W.H. Durum, J.D. Ren, and S.G. Heidel, is published as Geological Survey Circular 643. Copies are available free upon request from the Director, U.S. Geological Survey, Washington, D.C. 20242.

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(Note to Editor: Table No. 1 attached lists Public Health Standards for Public Water Supplies. Table #2 lists areas of sampling exceeding standards for drinking water.)

Table No. 1

U.S. PUBLIC HEALTH SERVICE STANDARDS
FOR PUBLIC WATER SUPPLIES

Concentrations in micrograms per liter (parts per billion)

	Mercury	Benzo(a)pyrene	Cadmium	Lead	Chromium (Hex)	Cobalt	Zinc
Recommended maximum concentrations*	--	10	--	--	-----	(A)	5000
Mandatory maximum concentrations**	5 (a)	50	10	50	50		----

* Maximum should not be exceeded if a more suitable supply is available.

** Concentrations in excess of maximum are grounds for rejection of the supply.

(a) Interim.

(b) No standards set.

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Table No. 2

Locations at which mandatory upper limits of metals were exceeded
(U.S. Public Health Service drinking water standards)*

(Concentrations in micrograms per liter, or parts per billion)				
<u>State</u>	<u>Location</u>	<u>Arsenic</u>	<u>Cadmium</u>	<u>Lead</u> <u>Mercury</u>
Alabama	Cahaba R. pump station, Birmingham		12	
"	Mobile R. at Government Street		65	
"	Mobile Tennessee R. at Whitesburg		99	
Arizona	Mineral Creek near Big Dome, 3 miles south of Ray		139	
Arkansas	Arkansas R. nr. Lock & Dam 3, below Pine Bluff	90		
"	Arkansas R. at Lock & Dam 6, below Little Rock		12	
"	Arkansas R. at Lock & Dam 13, below Fort Smith	140		
"	Hot Springs Reservoir on Bull Bayou		20	
"	Hurricane Creek near Sheridan		15	
"	Lake Winona on Alum Fork, Saline River		10	
"	North Sylamore Creek nr. Fifty Six	60		
"	Ouachita R. nr. Malvern, below Hot Springs		18	
"	White R. near Goshen, below Fayetteville	80		
California	Merced R. at Happy Isle Bridge near Yosemite			6.0
Conn.	Naugatuck R. at Beacon Falls		22	
Idaho	South Fork Coeur d'Alene R. at Smelterville		21	6.8
Illinois	Mississippi R. at Chester		12	
"	Mississippi R. at east St. Louis		16	
"	Ohio R. at Lock & Dam 53 near Grand Chain		15	

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* Many of the locations at which Public Health Service Standards were exceeded, are not points where water is withdrawn for public

<u>State</u>	<u>Location</u>	<u>Arsenic</u>	<u>Cadmium</u>	<u>Lead</u>	<u>Mercury</u>
Kentucky	Ohio R. at Louisville	70	20		
Louisiana	Calcasieu R. near Sulphur		36		
"	Cross Lake at Shreveport		16		
"	Red R. at Moncla		14		
Maine	St. Croix R. at Baring		22	890	
Miss.	Escatawpa R. at Moss Point		55		
Missouri	Mississippi R. at Cape Girardeau		20		
"	Mississippi R. at Cottonwood Pt.		15		
"	Missouri R. at St. Joseph		14		
"	Missouri R. at Lexington		25		
Nebraska	Big Blue R. at Barneston		40		
N. C.	Cape Fear R. at Lock 1 nr. Kelly	60			
"	Catawba R. nr. Charlotte	60			
N. Dak.	Red R. of the North, below Fargo		26		
Oklahoma	Cannoy R. nr. Ochelata		12		
	Kiamichi R. nr. Big Cedar			84	
Pa.	Lackawanna R. at Old Forge		32		
"	Spring Brook Reservoir nr. Wilkes-		27		
	Barre				
"	Tulpehocken Creek at Blue Marsh	60			
	damsite nr. Reading				
"	West Branch Susquehanna R. at			55	
	Renovo				
"	Holt Creek Reservoir nr. Pottsville		11		
S. C.	Sugar Creek nr. Ft. Mill	1,100			
S. D.	James R. below Byron		14		
"	James R. nr. Mitchell		12		
Tenn.	Katauga R. nr. Johnson City	60			

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