USGS Data & Reports: From the Lab to the Public

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USGS science for a changing world
NWQMC Monitoring Framework

- Collaborate
  - Develop monitoring objectives
  - Design monitoring program
- Convey results and findings
- Understand, protect, restore our waters
- Compile and manage data
- Collect field and lab data
- Assess and interpret data
Data Flow

Field → Lab → Data review → Data interpretation → Public
Lab

- Login and sample tracking
- Analytical methods
- Quality assurance
- Data Management & LIMS
• Seamless data transfer to NWIS by NWQL
  • Includes all analytical metadata

• Data validation by USGS Water Science Centers
  • 3-sets of eyes & consistent criteria

• Provisional data soon after analysis
  • Approved data after review
Data review

Field Notes

Field & Analytical Data

Sample Coding
Field Notes

- Paper or electronic
- Field methods
- Completeness
- Measurements & calculations
# Basic Tenets of Data Review

- **Timeliness of review is critical**
- **Outlier doesn’t mean wrong**
- **Multiple lines of evidence invaluable**
- **Deal with problems quickly and thoroughly**
- **Lab staff are a tremendous asset**
#1 Rule of Data Review

Consistency
Review Criteria

- Logic tests
- Outlier identification and remedy
Logic Tests
(aka – Is it even possible?)

Part vs Whole
Ion Balance
$1 < \text{pH} < 14$
$0 < \text{DO} < 20$
$0^\circ < \text{Temperature} < 40^\circ \text{C}$
Logic Tests
(aka – Is it even possible?)

- The illogical, if not impossible results:
  - $0 > \text{DO} > 20$
  - $0 > \text{Temperature} > 40^\circ \text{C}$
  - $1 > \text{pH} > 14$

- Typically these are field values
  - Review field notes
  - Revise the value only with proof…..don’t guess.
Logic Tests
Part vs Whole

- Dissolved concentrations cannot exceed total concentrations.
  - e.g. Filtered Fe ≤ Total Fe
  - e.g. where Total N = NO₂ + NO₃ + NH₃ + Organic N,
    - NO₂, NO₃, NH₃, and Organic N ≤ Total N

- Allow for analytical variability and uncertainty:
  - Concentrations ≥ 1 mg/L, 10% exceedance is allowed
  - Concentrations < 1 mg/L, exceedance may equal the LRL of the least precise of the 2 methods.
Logic Tests
Ion Balance

\[ \Sigma \text{ cations} = \Sigma \text{ anions} \]

5% difference OK for many natural waters

Differences \(>\) 5% allowable at very low ionic strength
OUTLIERS

an observation that is numerically distant from the rest of the data

- Outliers in space (1 well in a network)
- Outliers in time (new maximum in a time series)
- Outliers in relations (flow versus concentration)
STATION: ROARING FORK RIVER AT GLENWOOD SPRINGS, CO. 09085000

00925 Magnesium, wf

mg/L

00061 Discharge, insta cfs

sample_type  ○ ○ ○ Previous Years Envi. & Rep.
      ● ● ● Environmental (Current Year)
            □ □ □ Environmental (Last Year)
OUTLIERS

Not all outliers are bad........

......they may only be misunderstood
OUTLIERS

Steps taken once identified

- Multiple lines of evidence to reject or accept
- Review field notes
- Review significant dependent relations
- Review field QC samples (field blanks)
- Discuss with lab
- Rerun the analysis
Outlier Identification & Remedy: Failed Ion Balance

Does analysis include all major ions (MI’s)?
- Yes
  - Review time series plots for all MI’s. Any outliers ID’d?
    - Yes
      - Request rerun for the outlier
    - No
      - Reassess Balance. OK?
        - Yes
          - Talk with QW Spec and NWQL
        - No
          - Talk to QW Spec and NWQL
  - No
    - Review SC vs MI’s and MI’s vs Q plots. Any outliers ID’d?
      - Yes
        - Rerun outlier(s). Reassess balance. OK?
      - No
        - No
          - Move on and do better next time
          - Yes
            - Work with lab to get value.
    - Were they requested?
      - Yes
        - Reassess Balance. OK?
      - No
        - No
          - Yes
            - Update w/new value, QWDATA codes/comments, document
            - No
              - No
                - Yes
                  - Yes
                    - Yes
                      - Yes
The case of the covert outlier
Data can be rendered useless without comprehensive and consistent metadata.

Good metadata begins with good field notes, especially observations.
SAMPLE CODING

Consistent metadata required for each sample

- Location, date, time
- Field methods and equipment used
- QC sample data
Ready for Public Consumption

- Approved data are set to “Approved” in NWIS
- Rejected data are maintained in NWIS but masked from NWISWeb
- All approved data readily available through NWISWeb, USGS web utilities and reports
USGS Data Sources

- Annual Data Reports
- NWISWeb
- NWIS Mapper
- WaterWatch
- Water QualityWatch
- GroundwaterWatch
Annual Data Reports

- Supplements direct access to data
- Published for each USGS Water Science Center
- Published electronically since 2007 Water Year
- Includes on-line mapper utility for site location
- Completeness varies by Center
Annual Data Reports Mapper

Annual Water Data Reports Mapper—Water Years 2006 to 2009

Year: 2009

Note: Data reports for Water Year 2009 will be processed from October 2009 through April 2010 and will be posted site-by-site as they are completed.

Status:
- Sites are clickable only when zoom level is 9 or greater.
- Surface Site (stream, lake, wetlands, estuaries, ocean, diversions, outfalls)
- Groundwater Sites (wells, any subsurface)
- Atmospheric Sites (climate, weather)

Accessibility FOIA Privacy Policies and Notices

USGS
Science for a changing world
NWISWeb

- On-line access to 1.5 million sites nationwide
- Real-time and historical data
- Continuous and discrete measurement data
- Multiple search routines
- Multiple output options
- [http://waterdata.usgs.gov/nwis](http://waterdata.usgs.gov/nwis)
NWISWeb

USGS Water Data for the Nation

Data Category

Real-time data

Current-conditions data transmitted from selected
surface-water, groundwater, and water-quality sites.

Site information

Descriptive site information for all sites with links to all available
water data for individual sites.

Surface water

Water flow and levels in streams, lakes, and springs.

Groundwater

Water levels in wells.

Water quality

Chemical and physical data for streams, lakes, springs, and
wells.

Mapper

Map of all sites with links to all available water data for
individual sites.

Introduction

These pages provide access to water-resources data collected at
approximately 1.5 million sites in all 50 States, the District of
Columbia, and Puerto Rico. Online access to this data is organized
around the categories listed to the left.

The USGS investigates the occurrence, quantity, quality,
distribution, and movement of surface and underground waters and
disseminates the data to the public, State and local governments,
public and private utilities, and other Federal agencies involved with
managing our water resources.

About us  Help  Tutorial
NWIS Mapper

Map-based web search utility for NWISWeb
Click and zoom or address searches
Map, satellite, hybrid, or terrain backgrounds

http://wdr.water.usgs.gov/nwisgmap/
WaterWatch

- Streamflow web utility
- Data synthesis by State or Region
- Low and High-Flow statistical summaries
- Map and tabular output

http://waterwatch.usgs.gov/
Map of real-time streamflow compared to historical streamflow for the day of the year (United States)

Sunday, April 11, 2010 12:30 ET
WaterQualityWatch

Map utility for continuous water-quality data

Temperature, conductivity, pH, DO, turbidity

http://waterwatch.usgs.gov/wqwatch/
WaterQualityWatch

WaterQualityWatch -- Continuous Real-Time Water Quality of Surface Water in the United States

Real-Time Water Temperature, in °C

April 11, 2018 12:46ET

Map of the United States showing real-time water temperature data.

Example of Sites Displaying Surrogates:
California, Colorado, Texas

RTWQ FAQ:
What is the USGS?
What is continuous RTWQ?
How are sites selected?
Why continuous and real time?
How are these data used?
What are these measurements?
How are monitors maintained?
What is a surrogate?

Explorations:
Temp, Cond, pH, D.O., Turb, Disch
Groundwater Watch

Map utility for groundwater level data

Continuous or discrete measurements

Graphical and tabular output

Plots and statistical summaries

http://groundwaterwatch.usgs.gov/
USGS Publications
Review and Approval Process

“Fundamental Science Practices”

Author

Publication

Peer Reviewers

Supervisor

Science Center

“Bureau Approving Official”

Publication Citation

Previous Citation  ●  Viewing Record # 3  ●  Next Citation
USGS Series  ●  Professional Paper
Report Number  1017
Title  One deposits of the Gilman District, Eagle County, Colorado
Edition
Language  ENGLISH
Author(s)  Levering, T. G.; Tweto, Ogdin; Levering, T. G.
Year  1970
Originating office
USGS Library Call Number  -
Physical description  90 p.
ISBN

Online Document Versions

- View Report as .PDF (Requires plug-in*)
- View Plate as .JPG (Requires plug-in*)

Download free LizardTech plug-in now. Plug-in provides searchable text, section 508 compliant accessibility, advanced navigation, and print control.

Currently not available through the USGS Store

Abstract

The Gilman mining district, known also in the past as the Red Cliff district, is in the mountains of southeastern Eagle County, west-central Colorado. The district is the leading source of zinc in Colorado and one of the major base-metal mining districts in the state. As valued at the time of production, total output of zinc, silver, copper, lead, and gold through 1972 was about $288 million. About 90 percent of this total was produced after 1950. The productive part of the district is an area of about 3 square miles (7.8 square kilometers) on the northeast side of the deep canyon of the Eagle River between the small towns of Gilman and Red Cliff. The ore deposits are principally replacement deposits in dolomites of Mississippian and Devonian age and in quartzites of Cambrian age. A few production veins occur in Precambrian rocks. The replacement deposits drop out in the cliffs of the canyon wall and extend northward and eastward beneath Battle Mountain, which is a complex of a sequence of Pennsylvanian deltaic rocks. The deposits were originally worked through several separate mines along the canyon wall, but since 1918, all deposits in dolomite rocks except some small ones near Red Cliff, have been worked through the Eagle mine of the New Jersey Zinc Company at Gilman. The Gilman district lies on the eastern flank of the huge anticline of the Sawatch Range, near the steepling plunging north end of the anticline. Sedimentary rocks on the flanks of the part of the anticline dip homoclinally northward and to the south to a synclinal axis about 8 mi (13 km) northeast of Gilman and then rise more steeply to the Gore fault at the edge of the Gore Range. This horizon is broken by only a few faults in which are displacements of less than 100 ft (30 m). In contrast, the underlying Precambrian rocks are broken by numerous faults and shear zones related to the Homestake shear zone, a northeast-dipping master shear zone several miles wide. Fractures and shear zones along the northeast side of the master zone extend beneath the Gilman district. The Gilman district is at the northwestern edge of the northeast-trending Colorado mineral belt defined by mineralized areas and bodies of intrusive porphyries. Neighboring mining districts in the mineral belt to the southeast of Gilman are the Kokomo lead-silver district, 13 mi (21 km) distant; the Idaho, molybdenum district, 16 mi (26 km) distant; and the Leadville district, 20 mi (32 km) distant. These districts, as well as others farther afield, are characterized by abundant intrusive rocks of Late Triassic and middle Tertiary ages and by complex faults systems. The Gilman district in contrast contains only a single sill of porphyry and has very simple geologic structure. This probably reflects a position either at the side of or high above a batholith that is inferred from geologic and geophysical data to underlie the mineral belt at shallow depth. The rock column preserved in the district consists of, in succession downward, (1) grit, conglomerate, sandstone, and shale of the Pennsylvania (Kirtland) Formation; as much as 6,350 ft (1,930 m) thick; (2) shale, limestone, and sandstone of the Pennsylvanian Belden Formation, 200 ft (61 m) thick; (3) a sill of quartz latite porphyry of the Cretaceous Pando Porphyry, about 80 ft (24 m) thick intruded in the basal shale of the Belden Formation; (4) dolomized...
2004 • PP • 1652
Integrated investigations of environmental effects of historical mining in the Basin and Boulder Mining Districts, Boulder River watershed, Jefferson County, Montana
edited by Nimick, D. A.; Church, S. E.; Finger, S. E.

2007 • PP • 1651
Integrated Investigations of Environmental Effects of Historical Mining in the Animas River Watershed, San Juan County, Colorado
Edited by Church, Stanley E.; Von Guerard, Paul; Finger, Susan E.

1984 • PP • 1342
The evolution of the Southern California Uplift, 1955 through 1976
Castle, R. O.; Elliott, M. R.; Church, J. P.; Wood, S. H.

1983 • PP • 1245
Historical surface deformation near Oildale, California
Castle, Robert O.; Church, J. P.; Yerkes, R. F.; Manning, J. C.
Integrated Investigations of Environmental Effects of Historical Mining in the Animas River Watershed, San Juan County, Colorado

Edited by Stanley E. Church, Paul von Guerard, and Susan E. Finger

This publication comprises a Volume Contents of chapters (listed below) and a CD-ROM of data (contents shown in column at right).

The Animas River watershed in southwest Colorado is one of many watersheds in the western United States where historical mining has left a legacy of acid mine drainage and elevated concentrations of potentially toxic trace elements in surface streams. U.S. Geological Survey scientists have completed a major assessment of the environmental effects of historical mining in the Animas River watershed focusing on the area upstream of Silverton, Colo.—the Mineral Creek, Cement Creek, and upper Animas River basins. The study demonstrated how the watershed approach can be used to assess and rank mining-affected sites for possible cleanup. The study was conducted in collaboration with State and Federal land-management agencies and regional stakeholders groups.


Front Matter PDF (336 KB)—includes a Volume Contents, which is defined below:

**Volume 1**

A. Summary and conclusions from investigation of the effects of historical mining in the Animas River watershed, San Juan County, Colorado PDF (83.4 MB)
By U.S. Geological Survey

B. The Animas River watershed, San Juan County, Colorado PDF (13.5 MB)
By David von Guerard, Stanley E. Church, Douglas B. Yager, and John M. Besser

C. History of mining and milling practices and production in San Juan County, Colorado, 1871-1991 PDF (293 MB)
By William R. Jones

D. Impacts of historical mining on aquatic ecosystems—An ecological risk assessment PDF (1.3 MB)
By John M. Besser, Susan E. Finger, and Stanley E. Church

E. Watershed-scale characterization and investigation of processes responsible for environmental effects of historical mining

E1. Geologic framework PDF (204.3 MB)
   - Plate 1. Generalized geologic map of part of the Animas River watershed and vicinity, Silverton, Colorado, by D.B. Yager and D.J. Bove PDF (21.9 MB)
   - Plate 2. Ferricrete, manganocone, and bog iron occurrences with selected sedge bogs and active iron bog nodules in part of the Animas River watershed, San Juan County, Colorado, by D.B. Yager, S.E. Church, P.L. Verplanck, and Lurrie Wirt PDF (2.8 MB)

E2. Imaging spectroscopy applied to the Animas River watershed and Silverton caldera PDF (10 MB)
By Douglas B. Yager and Dana J. Bove

E3. Major styles of mineralization and hydrothermal alteration and related solid- and aqueous-phase geochemical signatures PDF (8.5 MB)
By Dana J. Bove, M. Alisa Mast, J. Bradley Dalton, Winfield G. Wright, and Douglas B. Yager

E4. Helicopter electromagnetic and magnetic surveys PDF (5.9 MB)
   - Plate 3. Total field magnetic map of the Animas River watershed study area, Colorado, by B.D. Smith, R.R. McDougal, Maryla Descz-Pan, and D.B. Yager PDF (3.3 MB)
   - Plate 4. Apparent conductivity map of the Animas River watershed study area, Colorado, by B.D. Smith, R.R. McDougal, Maryla Descz-Pan, and D.B. Yager PDF (3.1 MB)

E5. Mine inventory and compilation of mine-adv chemistry data PDF (1.2 MB)
By Bruce D. Smith, Robert R. McDougal, Maryla Descz-Pan, and Douglas B. Yager

E6. Mine and mill, mine waste dumps, and mill tailings as sources of contamination PDF (84 MB)
By Stanley E. Church, M. Alisa Mast, E. Paul Martin, and Carl L. Rich

E7. Characterization of background water quality PDF (16.1 MB)
By M. Alisa Mast, Philip L. Verplanck, Winfield G. Wright, and Dana J. Bove

E8. Aqueous-sulfate stable isotopes—A study of mining-affected and undisturbed acidic drainage PDF (327 KB)
By D. Kirk Nordstrom, Winfield G. Wright, M. Alisa Mast, Dana J. Bove, and Robert O. Rye
History of Mining and Milling Practices and Production in San Juan County, Colorado, 1871–1991

By William R. Jones

Chapter C of Integrated Investigations of Environmental Effects of Historical Mining in the Animas River Watershed, San Juan County, Colorado

Edited by Stanley E. Church, Paul von Guerard, and Susan E. Finner
National Water Quality Assessment (NAWQA) Program

The National Water-Quality Assessment Program (NAWQA) provides an understanding of water-quality conditions; whether conditions are getting better or worse over time; and how natural features and human activities affect those conditions. Regional and national assessments are possible because of a consistent study design and uniform methods of data collection and analysis. Monitoring data are integrated with geographic information on hydrological characteristics, land use, and other landscape features in models to extend water-quality understanding to unmonitored areas. Local, State, Tribal, and national stakeholders use NAWQA information to design and implement strategies for managing, protecting, and monitoring water resources in many different hydrologic and land-use settings across the Nation.

Featured Headlines, Activities, and Publications

- Contaminant Transport to Public Supply Wells (publications; press release; video podcast) (February 11, 2010)
- Redox Conditions in Aquifers (fact sheet, Decision-support tool (Microsoft Excel), additional information) (January 12, 2010)
- Pesticide Trends in Corn Belt Streams and Rivers (report; journal article; press release) (November 9, 2009)
- Agricultural Chemicals in our Environment (fact sheet; technical announcement; journal article series) (October 22, 2009)
- Chloride in Groundwater and Surface Water (report; press release) (September 16, 2009)
- Prediction of atrazine concentrations (interactive online mapping; technical announcement; report) (August 20, 2009)
- Mercury in Fish, Water, and Sediment (report; press release; podcast) (August 19, 2009)

Informing Decision Makers -- Linking Science to Water Management more on informing decision makers
Headlines, Activities, and Publications

2010

Publication release: Contaminant Transport to Public Supply Wells (publications; press release; video podcast) (February 11, 2010)

Publication release: Redox Conditions in Aquifers (fact sheet, Decision-support tool [Microsoft Excel], additional information) (January 12, 2010)

2009

Publication release: Pesticide Trends in Corn Belt Streams and Rivers (report; journal article; press release) (November 9, 2009)

Publication release: Agricultural Chemicals in our Environment (fact sheet; technical announcement; journal article series) (October 22, 2009)

Publication release: Chloride in Groundwater and Surface Water (report; press release) (September 15, 2009)

Modeling Tools: Prediction of atrazine concentrations (interactive online mapping; technical announcement; report) (August 20, 2009)

Publication release: Mercury in Fish, Water, and Sediment (report; press release; podcast) (August 19, 2009)

Publication release: Water quality in the High Plains aquifer (report; press release) (July 16, 2009)


Publication release: Water Quality in Carbonate Aquifers (June 25, 2009)

Website Updates: NAWQA Publications Now Available On-line by State or by selected topics, such as nutrients, pesticides, mercury, aquatic ecology, or drinking water (April 3, 2009)

For information on changes in nutrient concentrations and loads in streams and rivers and how these changes correspond to streamflow and nutrient sources, see the USGS report: Nutrient Trends in Streams and Rivers of the United States, 1993-2003

For information on how trends in total nitrogen and total phosphorus concentrations vary by major geographic regions of the U.S., see the article and supplemental material in Environmental Science and Technology: Regional Nutrient Trends in Streams and Rivers of the United States, 1993-2003

Technical Announcement

Maps - Changes in nutrient concentrations, sources, and streamflow, 1993-2003

- Changes in total phosphorus concentrations
- Changes in total phosphorus concentrations, adjusted for streamflow
- Changes in total nitrogen concentrations
- Changes in total nitrogen concentrations, adjusted for streamflow
- Changes in streamflow
- Changes in phosphorus and nitrogen inputs from manure
- Changes in phosphorus and nitrogen inputs from fertilizer
- Changes in population density and nitrogen loading from atmospheric deposition
Total Phosphorus Concentrations
Flow-adjusted
1993-2003

Explanation
Direction of trend
▲ Upward
▼ Downward
○ No significant trend

Magnitude of trend (percent from 1993 to 2003)
▲▲ Less than or equal to 33.0
▲▼ 33.1 - 66.0
▲▲ Greater than or equal to 66.1

Reference concentration (milligrams per liter)
- Less than or equal to 0.0698
- 0.0699 - 0.1750
- Greater than or equal to 0.1751

For information on changes in nutrient concentrations and loads in streams and rivers and how these changes correspond to streamflow and nutrient sources, see the USGS report: Nutrient Trends in Streams and Rivers of the United States, 1993-2003.

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- Changes in total nitrogen concentrations, adjusted for streamflow
- Changes in streamflow
- Changes in phosphorus and nitrogen inputs from manure
- Changes in phosphorus and nitrogen inputs from fertilizer
- Changes in population density and nitrogen loading from atmospheric deposition

By Lori A. Sprague, David K. Mueller, Gregory E. Schwarz, and David L. Lorenz

Abstract

Trends in streamflow and concentrations and loads of total phosphorus, total nitrogen, and nitrate were determined for the period from 1993 to 2003 in selected streams and rivers of the United States. Flow-adjusted trends in concentration (the trends that would have occurred in the absence of natural changes in streamflow), non-flow-adjusted trends in concentration (the trends resulting from both natural and human factors), and trends in load (trends in the nutrient mass transported downstream) were determined, and the results were examined spatially to determine whether a consistent pattern of trends occurred across groups of sites at multiple locations. Relations between the trends and changes in nutrient sources and streamflow are examined. See document for complete abstract.
Highlights of our latest research findings, and examples of application to real problems.

2009

- Surprising Findings on Mercury in Yellowstone National Park
- New Approach to Evaluating Selenium Toxicity in the Environment
- Fish in Some Streams Accumulate Mercury
- USGS Contributes to the Design of a Proposed National Mercury Monitoring Network (MercuryNet)
- A New Source of Methylmercury Entering the Pacific Ocean

2008

- Visualizing Contamination Pathways in the Subsurface
- Can We Use Phytoplankton in Coastal Waters as an Indicator of Global Climate Change?
- Mercury Found to Migrate Horizontally from Landfill
- Tackling Fish Endocrine Disruption
- Pesticides are Detected in Vernal Pools in Parks and Wildlife Refuges
- Measuring Antidepressants, Fungicides, and Insecticides in the Environment
- Detergents in Streams May Just Disappear

- Measuring Antidepressants, Fungicides, and Insecticides in the Environment
- Detergents in Streams and Estuaries
- Emerging Contaminants Targeted in a Reconnaissance of Ground Water and Untreated Drinking-Water Sources
- Biosolids, Animal Manure, and Earthworms: Is There a Connection?

2007

- Detecting Amphibian-Killing Fungus Helps Scientists Study Amphibian Declines
- Climate-Driven Ocean Changes Affect Estuaries: Pacific Ocean Cooling Triggers Phytoplankton Blooms in San Francisco Bay
- USGS Science Featured in a Special Issue of Applied Geochemistry on Contamination from Oil Production
- Hydrogen Measured in a New Test for Determining Subsurface Microbiological Activity at Contamination Sites
- Wastewater Indicators Shown to Degrade in Streams
- New Report Presents a Framework for Assessing the Sustainability of Monitored Natural Attenuation
- Endocrine Disruption Found in Fish Exposed to Municipal Wastewater
- Widespread Accumulations of Natural Perchlorate in Southwestern Soils
- What Mobilizes Arsenic in Ground Water?
- Mercury Concentrations in Streams Found to Go Through Daily Cycles
- Streamflow and Nutrient Delivery from the Mississippi River Basin to the Gulf of Mexico

2006

- Household Chemicals and Drugs Found in Biosolids from Wastewater Treatment Plants
- Biofilms in Streams Help Create Daily Variations in Metal Concentrations
- Monitoring Volatile Organic Compounds in Ground Water with Diffusion Samplers
Emerging Contaminants Targeted in a Reconnaissance of Ground Water and Untreated Drinking-Water Sources

Two national-scale reconnaissance studies recently conducted by the U.S. Geological Survey (USGS) were the first to collect baseline information on the environmental occurrence of pharmaceuticals, personal-care products, detergents, flame retardants, naturally occurring sterols, and other organic contaminants in ground water and untreated sources of drinking water in the United States. These contaminants are commonly associated with human- and animal-waste sources, though other natural and human-related sources are also possible. These studies follow a previous reconnaissance of U.S. streams (see sidebar).

Ground Water

Ground-water samples were collected from a network of 47 wells with common environmental conditions and which typically were not used for drinking water. The wells, in 18 states, were analyzed for 65 chemicals. The most frequently detected chemicals include N,N-diethyltoluamide (insect repellent), bisphenol A (plastic-and epoxy-manufacturing ingredient), tri(2-chloroethyl) phosphate (fire retardant), sulfamethoxazole (veterinary and human antibiotic), and 4-octylphenol monoethoxylate (detergent metabolite). The concentrations of chemicals detected were low. Eighty-seven percent of the 137 measured detections were less than 1 microgram per liter (μg/L). Mixtures of chemicals were common. Although similar chemicals were detected in the previous national stream reconnaissance, the chemicals were detected less frequently in this study's ground-water sites (38 percent of the sites) than they were in the stream reconnaissance (66 percent of the sites).

Untreated Drinking-Water Sources

Water samples were collected from untreated sources of drinking water at 25 ground-water and 49 surface-water sites in 25 states and Puerto Rico. The most frequently detected chemicals in surface water were cotinine (nicotine metabolite), and 1,7-dimethylxanthine (caffeine metabolite); and in ground water were carbamazepine (pharmaceutical), bisphenol-A (plastic- and epoxy-manufacturing ingredient), 1,7-dimethylxanthine (caffeine metabolite), and tri(2-
Recent advances in laboratory analytical methods have given scientists the tools to detect a wide range of contaminants in the environment at extremely low concentrations. The findings of these reconnaissance studies support other recent scientific studies using low-level detection technologies that document the environmental presence of chemicals not commonly monitored in water resources—chemicals often associated with human and animal wastewaters and biosolids. As detection technologies improve, scientists are likely to find more and a larger variety of these chemicals in ground water, streams, rivers, and drinking-water sources in the future. It is important to note that detection at a low concentration does not necessarily signal a health concern, and that some of the chemicals detected in these reconnaissance studies can occur naturally. Data from these surveys will help scientists, regulators, water-resource managers, and health professionals to determine if the concentrations and mixtures of chemicals measured in these waters pose a threat to human or environmental health, and will help with the development of mitigating strategies where needed.

References


More Information

- National Stream Reconnaissance for Emerging Contaminants

Related Headlines

- Measuring Antidepressants, Fungicides, and Insecticides in the Environment
- Detergents in Streams May Just Disappear
- Biosolids, Animal Manure, and Earthworms: Is There a Connection?
- Wastewater Indicators Shown to Decade in Streams
Abstract

This report presents water-quality data from two nationwide studies on the occurrence and distribution of organic wastewater contaminants. These data are part of the continuing effort of the U.S. Geological Survey Toxic Substances Hydrology Program to collect baseline information on the environmental occurrence of pharmaceuticals and other organic wastewater contaminants.

In 2000, samples were collected from 47 ambient ground-water sites (not drinking-water wells) in 18 states and analyzed for 65 organic wastewater contaminants. In the summer of 2001, samples were collected from 74 sources of raw, untreated, drinking water in 25 states and Puerto Rico and analyzed for 100 organic wastewater contaminants. These sources comprise 25 ground-water and 49 surface-water sources of drinking water serving populations ranging from one family to more than 8 million people. Site selection for both studies focused on areas known or suspected to contain sources of animal and/or human wastewater.

The five most frequently detected compounds in samples collected from ambient groundwater sites are N,N-diethyltoluamide (35 percent, insect repellant), bisphenol A (30 percent, plastic- and epoxy-manufacturing ingredient), tri(2-chloroethyl) phosphate (30 percent, fire retardant), sulfamethoxazole (22 percent, veterinary and human antibiotic), and 4-acyclophenoxypropyl monoethoxylate (19 percent, detergent metabolite). The five most frequently detected organic wastewater contaminants in samples of untreated drinking water from surface-water sources are chlorobenzene (50 percent, natural petroleum), metabolites (3 percent, other organic wastewater contaminants), 4-acyclophenoxypropyl monoethoxylate (19 percent, detergent metabolite), sulfamethoxazole (22 percent, veterinary and human antibiotic), and bisphenol A (30 percent, plastic- and epoxy-manufacturing ingredient).
Water-Quality Data for Pharmaceuticals and Other Organic Wastewater Contaminants in Ground Water and in Untreated Drinking Water Sources in the United States, 2000–01
1. Map showing location of surface- and ground-water sampling sites, 2000 through 2001

Tables

[Click on table title to view in Excel format]

1. **Surface- and ground-water sites analyzed in 2000 and 2001**
2. Samples collected from surface- and ground-water sites analyzed for selected antibiotic analytes in 2000 and 2001
3. Samples collected from surface- and ground-water sites analyzed for selected human pharmaceutical analytes in 2000 and 2001
4. Samples collected from surface- and ground-water sites analyzed for selected organic wastewater analytes in 2000 and 2001
5. Quality-assurance samples from surface- and ground-water sites analyzed in 2000 and 2001
6. Naturally occurring compounds
<table>
<thead>
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Mount St. Helens

Select One
1964 - 1984

Mount St. Helens 1964
Mount St. Helens 1967
Mount St. Helens 1970
Mount St. Helens 1972
Mount St. Helens 1973
Mount St. Helens 1974
Mount St. Helens 1975
Mount St. Helens 1977
Mount St. Helens 1978
Mount St. Helens 1979
Mount St. Helens 1980
Mount St. Helens 1980 March
Mount St. Helens 1980 April
Mount St. Helens 1980 May
Mount St. Helens 1980 June
Mount St. Helens 1980 July
Mount St. Helens 1980 July 22
Mount St. Helens 1980 August
Mount St. Helens 1980 August 7
Mount St. Helens 1980 September
Mount St. Helens 1980 October

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<table>
<thead>
<tr>
<th>No.</th>
<th>Image</th>
<th>Description</th>
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</table>
Mount St. Helens in eruption on May 18, 1980; with the upper third of the mountain centered in the photo. Mount Adams in background. Skamania County, Washington.

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