

STUDY UNIT DESIGN

Stream Chemistry and Ecology

Surface-water assessments included water, bed sediment, and fish tissue chemistry; fish, invertebrate, and algal communities; and physical habitat. Sites were chosen across the study area for spatial coverage and distribution in the major aquatic ecological settings within the Allegheny and Monongahela River Basins (fig. 26).

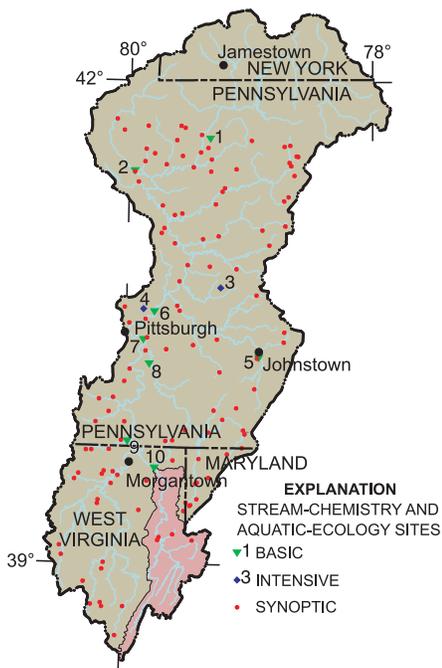


Figure 26. In addition to intensive water-quality sampling at a few sites, one-time sampling at many sites across the study area provided data related to specific land uses. The Cheat River Basin (shaded pink) was similarly sampled.

Basic and intensive sites were sampled monthly for chemistry and annually for ecological condition. One urban site and one agricultural site also were intensively sampled during storms to assess the influence of storm runoff on stream contaminant concentrations. Eighty-nine additional synoptic sites were sampled once to assess the influence of coal mining on water quality across the study area.

Ground-Water Chemistry

Two reconnaissance-type studies were done. The first focused on the fractured-rock aquifers of the coal-bearing Pittsburgh Series rocks of middle and late Pennsylvanian age. The second was set in the coarse- and fine-grained glaciofluvial deposits of the valley-fill aquifers in the northern area of the Allegheny River Basin (fig. 27).

An additional study that focused on mining land use involved sampling of wells that drew water from the fractured-rock aquifers and that

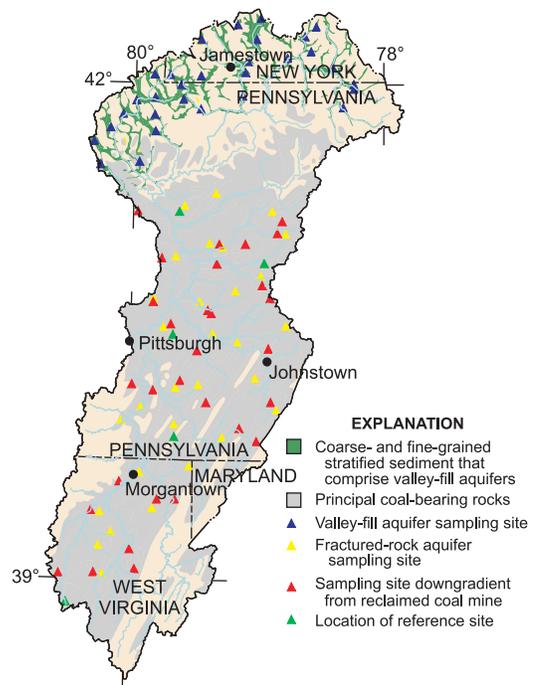


Figure 27. Ground water was sampled from two major aquifer systems, valley-fill aquifers of the northern Allegheny River Basin, and fractured-rock aquifers in the Pittsburgh Series rocks that contain the largest quantities of commercially minable bituminous coal in the ALMN.

were near surface coal mines where mining and reclamation efforts have been completed. The quality of these samples was compared to that of water from 15 wells sampled in unmined areas of the same aquifers.

Site number (fig. 26)	Site name	Site type	Basin area (square miles)	Site number (fig. 26)	Site name	Site type	Basin area (square miles)
1	East Hickory Creek near Queen, Pa.	Forested	20.3	6	Allegheny River at New Kensington, Pa.	Mixed	11,500
2	French Creek at Utica, Pa.	Mixed	1,028	7	Monongahela River at Braddock, Pa.	Mixed	7,337
3	South Branch Plum Creek at Five Points, Pa.	Agriculture	33.3	8	Youghiogheny River at Sutersville, Pa.	Mixed	1,715
4	Deer Creek near Dorseyville, Pa.	Urban	27.0	9	Dunkard Creek at Shannopin, Pa.	Mining	4,440
5	Stonycreek River at Ferndale, Pa.	Mining	451	10	Cheat River near Mt. Nebo, W. Va.	Mixed	1,132

SUMMARY OF DATA COLLECTION IN THE ALLEGHENY AND MONONGAHELA RIVER BASINS, 1996–98

Study component	What data were collected and why	Types of sites sampled	Number of sites	Sampling frequency and period
Stream Chemistry				
Basic Sites— General water chemistry	Concentrations, seasonal variation, and annual loads. Data included streamflow, field measurements, major ions, nutrients, organic carbon, suspended sediment, trace elements.	Basic Fixed Sites: Representative of common land-use mixes, as well as basin outflow sites.	8	Monthly, April 1996–Sept. 1998
Intensive sites— Pesticides and VOCs	Concentrations and seasonal variations in pesticides. Data included same constituents as above, plus 83 pesticides (dissolved) and 87 volatile organic compounds (VOCs) (only 1 site).	Basic Fixed Sites with intensive urban or agricultural land use.	2	1997, 1998
Contaminants in bed sediments	Occurrence and distribution of contaminants in bed sediment. Data include trace elements, organochlorine compounds, and volatile organic compounds.	Depositional zones of most stream sites sampled in other components of study.	19	Monthly and more frequently
Contaminants in fish tissue	Occurrence and distribution of contaminants in biota. Data included total PCBs, 30 organochlorine pesticides in whole fish, and 24 trace elements in fish livers.	Most stream sites sampled in other components of study where tissue could be collected.	17	Fish Tissue: Summer 1996 and Summer 1997 (Duplicate taxa at two sites)
Stream Ecology				
Ecological assessments	Macroinvertebrates (benthic invertebrates), fish, algae, aquatic and riparian habitat.	Basic Fixed Sites. Intensive Sites.	8 2	1996–97 (10 sites), 1998 (6 sites) One 3-reach site 1996 and 1997
Synoptic studies	Unmined basin to compare to mined basins. The same data were collected at Basic Sites.	Synoptic Site.	1	Once in 1997
Ground-Water Chemistry				
Aquifer survey— Pittsburgh Series fractured rock	Assess quality across aquifer extent. Data include field measurements, major ions, trace metals, nutrients, Pesticides, VOCs, radon, dissolved organic carbon (DOC).	Existing domestic wells chosen with a statistically random selection process. Well depth range 30 to 250 feet.	30	Once in 1996 (July–August)
Aquifer survey— Glaciofluvial deposits of the valley-fill aquifers	Assess quality across aquifer extent. Data include field measurements, major ions, nutrients, pesticides, VOCs, radon, dissolved organic carbon (DOC).	Existing domestic wells chosen with a statistically random selection process. Well depth range 30 to 250 feet.	30	Once in 1996 (September–October)
Land-use effects— Surface coal mining	Compare ground-water quality near reclaimed surface mines to that in unmined areas. Data include major ions, trace metals, nutrients, VOCs, radon, trace elements, dissolved organic carbon (DOC), chlorofluorocarbons (CFCs).	Existing domestic wells chosen with a statistically random selection process. Well depth range 30 to 250 feet. (Data from 10 fractured-rock sampling sites were re-used as reference data in the Land-use effects study.)	45	Once in 1997 (August–October)
Special Studies				
Low-flow synoptic survey of streams in the Appalachian coal fields	To assess quality of surface water relative to type and age of coal mining in the basins. Standard: Mine-drainage indicators, field measurements. Intensive: same as standard sites, plus: major ions, trace elements, macroinvertebrates, aquatic habitat.	Standard Site network.	89	Standard sites: Once in summer 1998
		Intensive Site network.	32	Intensive sites: Once in summer 1998

GLOSSARY

Aquifer—A water-bearing layer of soil, sand, gravel, or rock that will yield usable quantities of water to a well.

Background concentration—A concentration of a substance in a particular environment that is indicative of minimal influence by human (anthropogenic) sources.

Bed sediment—The material that temporarily is stationary in the bottom of a stream or other watercourse.

DDT—Dichloro-diphenyl-trichloroethane. An organochlorine insecticide no longer registered for use in the United States.

Ground water—In general, any water that exists beneath the land surface, but more commonly applied to water in fully saturated soils and geologic formations.

Herbicide—A chemical or other agent applied for the purpose of killing undesirable plants. See also Pesticide.

Human health advisory—Guidance provided by U.S. Environmental Protection Agency, State agencies, or scientific organizations, in the absence of regulatory limits, to describe acceptable contaminant levels in drinking water or edible fish.

Insecticide—A substance or mixture of substances intended to destroy or repel insects. See also Pesticides.

Maximum contaminant level (MCL)—Maximum permissible level of a contaminant in water that is delivered to any user of a public water system. MCLs are enforceable standards established by the U.S. Environmental Protection Agency.

Method detection limit—The minimum concentration of a substance that can be accurately identified and measured with present laboratory technologies.

Micrograms per liter ($\mu\text{g/L}$)—A unit expressing the concentration of constituents in solution as weight (micrograms) of solute per unit volume (liter) of water; equivalent to one part per billion in most stream water and ground water. One thousand micrograms per liter equals 1 milligram per liter.

Milligrams per liter (mg/L)—A unit expressing the concentration of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water; equivalent to one part per million in most stream water and ground water. One thousand micrograms per liter equals 1 mg/L .

Organochlorine compound—Synthetic organic compounds containing chlorine. As generally used, term refers to compounds containing mostly or exclusively carbon, hydrogen, and chlorine. Examples include organochlorine insecticides, polychlorinated biphenyls, and some solvents containing chlorine.

Pesticide—A chemical applied to crops, rights of way, lawns, or residences to control weeds, insects, fungi, nematodes, rodents, or other “pests.”

pH—The logarithm of the reciprocal of the hydrogen ion concentration (activity) of a solution; a measure of the

acidity (pH less than 7) or alkalinity (pH greater than 7) of a solution; a pH of 7 is neutral.

Polychlorinated biphenyls (PCBs)—A mixture of chlorinated derivatives of biphenyl, marketed under the trade name Aroclor with a number designating the chlorine content (such as Aroclor 1260). PCBs were used in transformers and capacitors for insulating purposes and in gas pipeline systems as a lubricant. Further sale for new use was banned by law in 1979.

Secondary maximum contaminant level (SMCL)—The maximum contamination level in public water systems that, in the judgment of the U.S. Environmental Protection Agency (USEPA), is required to protect the public welfare. SMCLs are secondary (nonenforceable) drinking water regulations established by the USEPA for contaminants that may adversely affect the odor or appearance of such water.

Semivolatile organic compound (SVOC)—Operationally defined as a group of synthetic organic compounds that are solvent-extractable and can be determined by gas chromatography/mass spectrometry. SVOCs include phenols, phthalates, and polycyclic aromatic hydrocarbons (PAHs).

Suspended sediment—Particles of rock, sand, soil, and organic detritus carried in suspension in the water column, in contrast to sediment that moves on or near the streambed or rests on the bottom of the stream.

Trace element—An element found in only minor amounts (concentrations less than 1.0 milligram per liter) in water or sediment; includes arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.

Upgradient—Of or pertaining to the place(s) from which ground water originated or traveled through before reaching a given point in an aquifer.

Volatile organic compounds (VOCs)—Organic chemicals that have a high vapor pressure relative to their water solubility. VOCs include components of gasoline, fuel oils, and lubricants, as well as organic solvents, fumigants, and some inert ingredients in pesticides, and some byproducts of chlorine disinfection.

Water-quality guidelines—Specific levels of water quality which, if reached, may adversely affect human health or aquatic life. These are nonenforceable guidelines issued by a governmental agency or other institution.

Water-quality standards—State-adopted and U.S. Environmental Protection Agency-approved ambient standards for water bodies. Standards include the use of the water body and the water-quality criteria that must be met to protect the designated use or uses.

Yield—The mass of material or constituent transported by a river in a specified period of time divided by the drainage area of the river basin.

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Diverse aquatic communities can be found in western tributaries.



More than two-thirds of the study area is hemlock and hardwood forest.

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Urban areas generally are within river valleys.

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Farm fields, intermixed with forest, follow hill contours.

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Coal mining is a difficult land use to quantify but is one that can significantly alter water quality.

APPENDIX—WATER-QUALITY DATA FROM THE ALLEGHENY AND MONONGAHELA RIVER BASINS IN A NATIONAL CONTEXT

For a complete view of Allegheny and Monongahela River Basins data and for additional information about specific benchmarks used, visit our Web site at <http://water.usgs.gov/nawqa/>. Also visit the NAWQA Data Warehouse for access to NAWQA data sets at <http://water.usgs.gov/nawqa/data>.

This appendix is a summary of chemical concentrations and biological indicators assessed in the Allegheny and Monongahela River Basins. Selected results for this Study Unit are graphically compared to results from as many as 36 NAWQA Study Units investigated from 1991 to 1998 and to national water-quality benchmarks for human health, aquatic life, or fish-eating wildlife. The chemical and biological indicators shown were selected on the basis of frequent detection, detection at concentrations above a national benchmark, or regulatory or scientific importance. The graphs illustrate how conditions associated with each land use sampled in the Allegheny and Monongahela River Basins compare to results from across the Nation, and how conditions compare among the several land uses. Graphs for chemicals show only detected concentrations and, thus, care must be taken to evaluate detection frequencies in addition to concentrations when comparing study-unit and national results. For example, metolachlor concentrations in the Allegheny and Monongahela River Basins urban stream sampled were similar to the national distribution, but the detection frequency was much higher (96 percent compared to 64 percent).

CHEMICALS IN WATER

Concentrations and detection frequencies, Allegheny and Monongahela River Basins, 1996–98—Detection sensitivity varies among chemicals and, thus, frequencies are not directly comparable among chemicals

◆ Detected concentration in Study Unit

66 38 Frequencies of detection, in percent. Detection frequencies were not censored at any common reporting limit. The left-hand column is the study-unit frequency and the right-hand column is the national frequency

-- Not measured or sample size less than two

12 Study-unit sample size. For ground water, the number of samples is equal to the number of wells sampled

National ranges of detected concentrations, by land use, in 36 NAWQA Study Units, 1991–98—Ranges include only samples in which a chemical was detected



National water-quality benchmarks

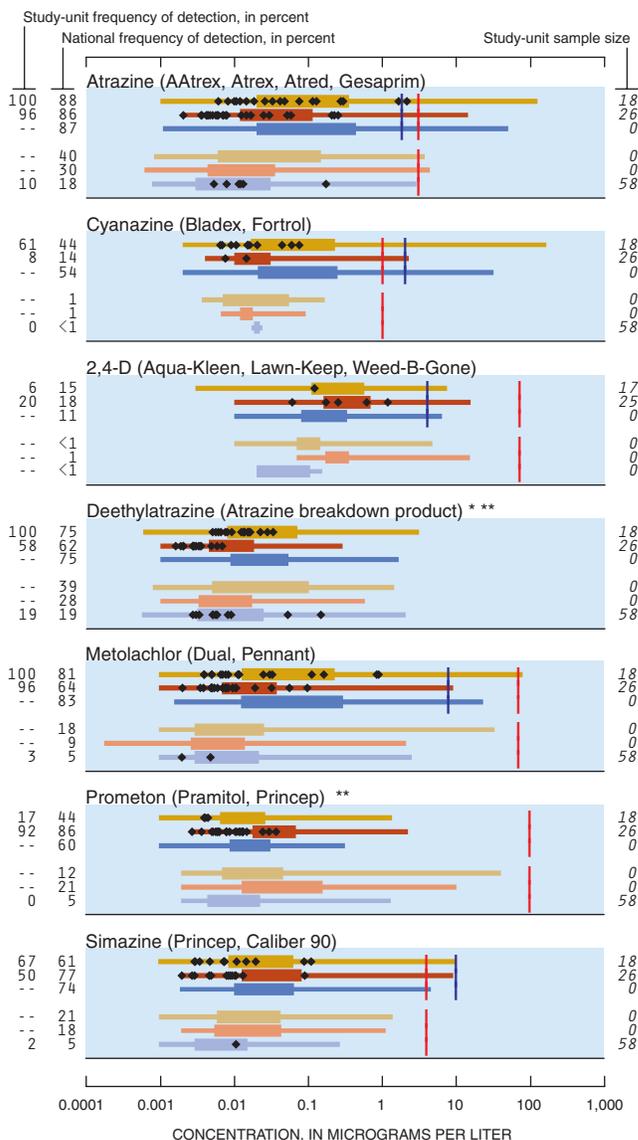
National benchmarks include standards and guidelines related to drinking-water quality, criteria for protecting the health of aquatic life, and a goal for preventing stream eutrophication due to phosphorus. Sources include the U.S. Environmental Protection Agency and the Canadian Council of Ministers of the Environment

- | Drinking-water quality (applies to ground water and surface water)
- | Protection of aquatic life (applies to surface water only)
- | Prevention of eutrophication in streams not flowing directly into lakes or impoundments

* No benchmark for drinking-water quality

** No benchmark for protection of aquatic life

Pesticides in water—Herbicides



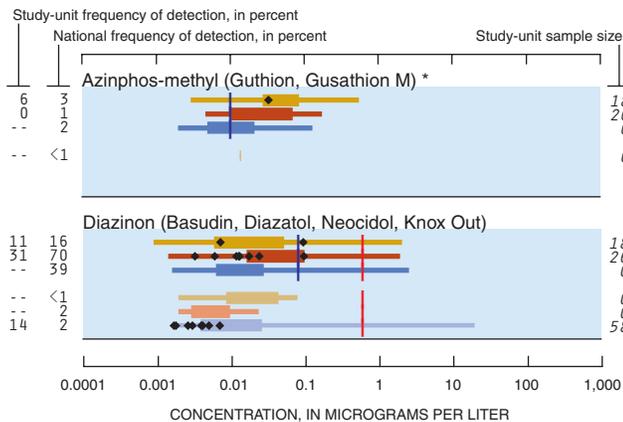
Other herbicides detected

- Acetochlor (Harness Plus, Surpass) * **
- Acifluorfen (Blazer, Tackle 2S) **
- Alachlor (Lasso, Bronco, Lariat, Bullet) **
- Bentazon (Basagran, Bentazone) **
- Bromoxynil (Buctril, Brominal) *
- DCPA (Dacthal, chlorthal-dimethyl) ***
- Dicamba (Banvel, Dianat, Scotts Proturf)
- Dichlorprop (2,4-DP, Seritox 50, Lentemul) ***
- Diuron (Crisuron, Karmex, Diurex) **
- EPTC (Eptam, Farmarox, Alirox) ***
- Fenuron (Fenulon, Fenidim) ***
- MCPA (Rhomene, Rhonox, Chiptox)
- Metribuzin (Lexone, Sencor)
- Napropamide (Devrinol) ***
- Neburon (Neburea, Neburyl, Noruben) ***
- Pendimethalin (Pre-M, Prowl, Stomp) ***
- Propachlor (Ramrod, Satecid) **
- Tebuthiuron (Spike, Tebusan)
- Terbacil (Sinbar) **

Herbicides not detected

Benfluralin (Balan, Benefin, Bonalan) * **
 Bromacil (Hyvar X, Urox B, Bromax)
 Butylate (Sutan +, Genate Plus, Butilate) **
 Chloramben (Amiben, Amilon-WP, Vegiben) **
 Clopyralid (Stinger, Lontrel, Transline) * **
 2,4-DB (Butyrac, Butoxone, Embutox Plus, Embutone) * **
 Dacthal mono-acid (Dacthal breakdown product) * **
 2,6-Diethylaniline (Alachlor breakdown product) * **
 Dinoseb (Dinosebe)
 Ethalfuralin (Sonalan, Curbit) * **
 Fluometuron (Flo-Met, Cotoran) **
 Linuron (Lorox, Linex, Sarclax, Linurex, Afalon) *
 MCPB (Thistrol) * **
 Molinate (Ordram) * **
 Norflurazon (E vital, Predict, Solicam, Zorial) * **
 Oryzalin (Surflan, Dirimal) * **
 Pebulate (Tillam, PEBC) * **
 Picloram (Grazon, Tordon)
 Pronamide (Kerb, Propyzamid) **
 Propanil (Stam, Stampede, Redeem, Remedy) * **
 Propham (Tuberite) **
 2,4,5-T **
 2,4,5-TP (Silvex, Fenoprop) **
 Thiobencarb (Bolero, Saturn, Benthicarb) * **
 Triallate (Far-Go, Avadex BW, Tri-allate) *
 Triclopyr (Garlon, Grandstand, Redeem, Remedy) * **
 Trifluralin (Treflan, Gowan, Tri-4, Trific)

Pesticides in water—Insecticides



Other insecticides detected

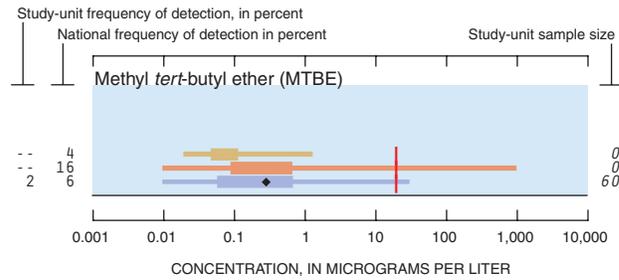
Carbaryl (Carbamine, Denapon, Sevin)
 Carbofuran (Furadan, Curaterr, Yaltox)
 Chlorpyrifos (Brodan, Dursban, Lorsban)
 Fonofos (Dyfonate, Capfos, Cudgel, Tycap) **

Insecticides not detected

Aldicarb (Temik, Ambush, Pounce)
 Aldicarb sulfone (Standak, aldoxy carb)
 Aldicarb sulfoxide (Aldicarb breakdown product)
 ρ,ρ' -DDE
 Dieldrin (Panoram D-31, Octalox, Compound 497)
 Disulfoton (Disyston, Di-Syston) **
 Ethoprop (Mocap, Ethoprophos) * **
 alpha-HCH (alpha-BHC, alpha-lindane) **
 gamma-HCH (Lindane, gamma-BHC)
 3-Hydroxycarbofuran (Carbofuran breakdown product) * **
 Malathion (Malathion)
 Methiocarb (Slug-Geta, Grandslam, Mesuroil) * **
 Methomyl (Lanox, Lannate, Acinate) **
 Methyl parathion (Penncap-M, Folidol-M) **
 Oxamyl (Vydate L, Pratt) **
 Parathion (Roethyl-P, Alkron, Panthion, Phoskil) *
cis-Permethrin (Ambush, Astro, Pounce) * **
 Phorate (Thimet, Granutox, Geomet, Rampart) * **
 Propargite (Comite, Omite, Ornamite) * **
 Propoxur (Baygon, Blattanex, Uden, Proprotox) * **
 Terbufos (Contraven, Counter, Pilarfox) **

Volatile organic compounds (VOCs) in ground water

These graphs represent data from 16 Study Units, sampled from 1996 to 1998



Other VOCs detected

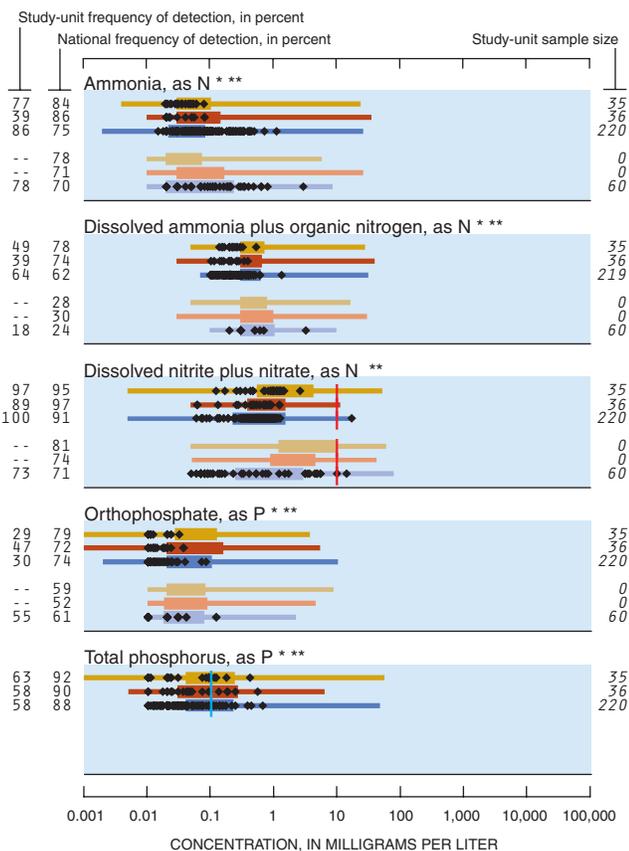
Benzene
 Bromodichloromethane (Dichlorobromomethane)
 2-Butanone (Methyl ethyl ketone (MEK)) *
sec-Butylbenzene *
 Carbon disulfide *
 Chlorobenzene (Monochlorobenzene)
 Chlorodibromomethane (Dibromochloromethane)
 Chloromethane (Methyl chloride)
 Dichlorodifluoromethane (CFC 12, Freon 12)
cis-1,2-Dichloroethene ((*Z*)-1,2-Dichloroethene)
 Dichloromethane (Methylene chloride)
 1,2-Dimethylbenzene (*o*-Xylene)
 1,4-Epoxy butane (Tetrahydrofuran, Diethylene oxide) *
 Ethenylbenzene (Styrene)
 Ethylbenzene (Phenylethane)
 Iodomethane (Methyl iodide) *
 Tetrachloroethene (Perchloroethene)
 Tetrachloromethane (Carbon tetrachloride)
 Tribromomethane (Bromoform)
 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113) *
 1,1,1-Trichloroethane (Methylchloroform)
 Trichloroethene (TCE)
 Trichloromethane (Chloroform)
 1,2,3-Trimethylbenzene (Hemimellitene) *
 1,2,4-Trimethylbenzene (Pseudocumene) *

VOCs not detected

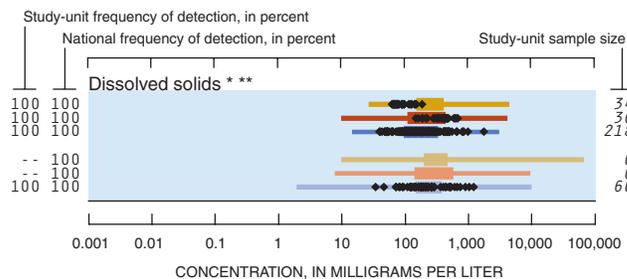
tert-Amylmethylether (*tert*-amyl methyl ether (TAME)) *
 Bromobenzene (Phenyl bromide) *
 Bromochloromethane (Methylene chlorobromide)
 Bromoethene (Vinyl bromide) *
 Bromomethane (Methyl bromide)
n-Butylbenzene (1-Phenylbutane) *
tert-Butylbenzene *
 3-Chloro-1-propene (3-Chloropropene) *
 1-Chloro-2-methylbenzene (*o*-Chlorotoluene)
 1-Chloro-4-methylbenzene (*p*-Chlorotoluene)
 Chloroethane (Ethyl chloride) *
 Chloroethene (Vinyl chloride)
 1,2-Dibromo-3-chloropropane (DBCP, Nemagon)
 1,2-Dibromoethane (Ethylene dibromide, EDB)
 Dibromomethane (Methylene dibromide) *
trans-1,4-Dichloro-2-butene ((*Z*)-1,4-Dichloro-2-butene) *
 1,2-Dichlorobenzene (*o*-Dichlorobenzene)
 1,3-Dichlorobenzene (*m*-Dichlorobenzene)
 1,4-Dichlorobenzene (*p*-Dichlorobenzene)
 1,2-Dichloroethane (Ethylene dichloride)
 1,1-Dichloroethane (Ethylidene dichloride) *
 1,1-Dichloroethene (Vinylidene chloride)
trans-1,2-Dichloroethene ((*E*)-1,2-Dichloroethene)
 1,2-Dichloropropane (Propylene dichloride)
 2,2-Dichloropropane *
 1,3-Dichloropropane (Trimethylene dichloride) *
trans-1,3-Dichloropropene ((*E*)-1,3-Dichloropropene)
cis-1,3-Dichloropropene ((*Z*)-1,3-Dichloropropene)
 1,1-Dichloropropene *
 Diethyl ether (Ethyl ether) *
 Diisopropyl ether (Diisopropylether (DIPE)) *
 1,3 & 1,4-Dimethylbenzene (*m*-&*p*-Xylene)
 Ethyl methacrylate *
 Ethyl *tert*-butyl ether (Ethyl-*t*-butyl ether (ETBE)) *

- 1-Ethyl-2-methylbenzene (2-Ethyltoluene) *
- Hexachlorobutadiene
- 1,1,1,2,2,2-Hexachloroethane (Hexachloroethane)
- 2-Hexanone (Methyl butyl ketone (MBK)) *
- Isopropylbenzene (Cumene) *
- p-Isopropyltoluene (p-Cymene) *
- Methyl acrylonitrile *
- Methyl-2-methacrylate (Methyl methacrylate) *
- 4-Methyl-2-pentanone (Methyl isobutyl ketone (MIBK)) *
- Methyl-2-propenoate (Methyl acrylate) *
- Methylbenzene (Toluene)
- Naphthalene
- 2-Propanone (Acetone) *
- 2-Propenenitrile (Acrylonitrile)
- n-Propylbenzene (Isocumene) *
- 1,1,2,2-Tetrachloroethane *
- 1,1,1,2-Tetrachloroethane
- 1,2,3,4-Tetramethylbenzene (Prenhitene) *
- 1,2,3,5-Tetramethylbenzene (Isodurene) *
- 1,2,4-Trichlorobenzene
- 1,2,3-Trichlorobenzene *
- 1,1,2-Trichloroethane (Vinyl trichloride)
- Trichlorofluoromethane (CFC 11, Freon 11)
- 1,2,3-Trichloropropane (Allyl trichloride)
- 1,3,5-Trimethylbenzene (Mesitylene) *

Nutrients in water

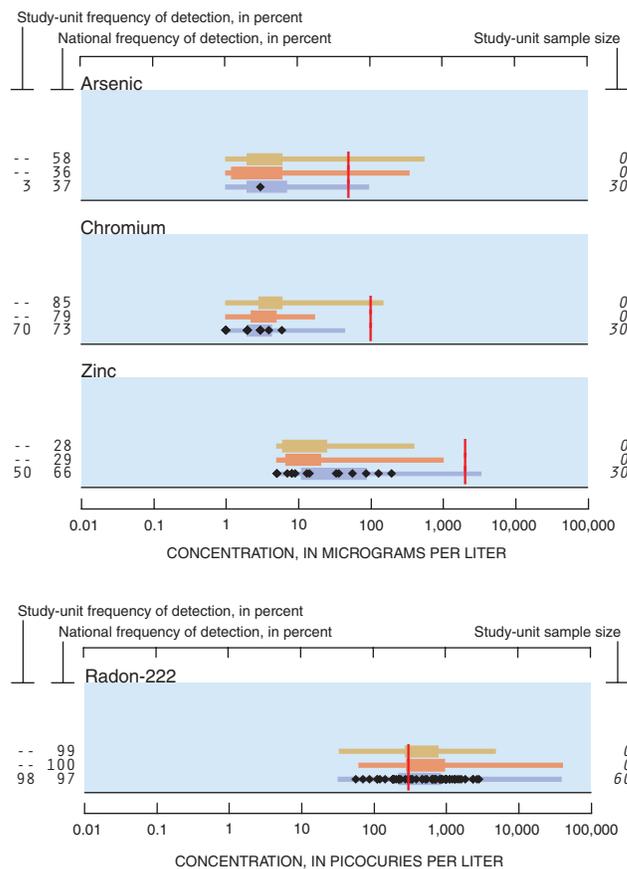


Dissolved solids in water



Trace elements in ground water

Trace-element data are only from the fractured rock aquifer survey; no trace element data were collected from the glacial sediments aquifer



Other trace elements detected

- Lead
- Selenium

Trace elements not detected

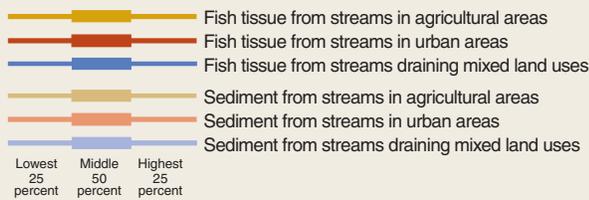
- Cadmium
- Uranium

CHEMICALS IN FISH TISSUE AND BED SEDIMENT

Concentrations and detection frequencies, Allegheny and Monongahela River Basins, 1996–98—Detection sensitivity varies among chemicals and, thus, frequencies are not directly comparable among chemicals. Study-unit frequencies of detection are based on small sample sizes; the applicable sample size is specified in each graph

- ◆ Detected concentration in Study Unit
- 66 38 Frequencies of detection, in percent. Detection frequencies were not censored at any common reporting limit. The left-hand column is the study-unit frequency and the right-hand column is the national frequency
- Not measured or sample size less than two
- 12 Study-unit sample size

National ranges of concentrations detected, by land use, in 36 NAWQA Study Units, 1991–98—Ranges include only samples in which a chemical was detected

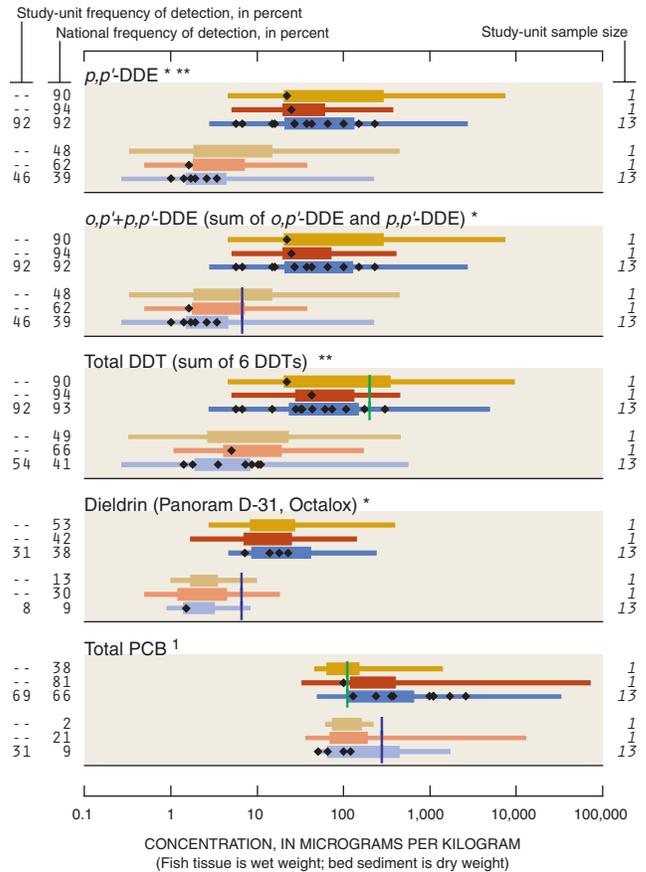
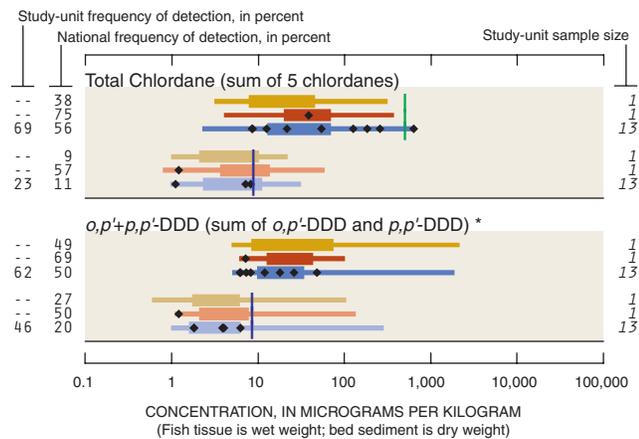


National benchmarks for fish tissue and bed sediment

National benchmarks include standards and guidelines related to criteria for protection of the health of fish-eating wildlife and aquatic organisms. Sources include the U.S. Environmental Protection Agency, other Federal and State agencies, and the Canadian Council of Ministers of the Environment

- | Protection of fish-eating wildlife (applies to fish tissue)
- | Protection of aquatic life (applies to bed sediment)
- * No benchmark for protection of fish-eating wildlife
- ** No benchmark for protection of aquatic life

Organochlorines in fish tissue (whole body) and bed sediment



¹ The national detection frequencies for total PCB in sediment are biased low because about 30 percent of samples nationally had elevated detection levels compared to this Study Unit. See <http://water.usgs.gov/nawqa/> for additional information.

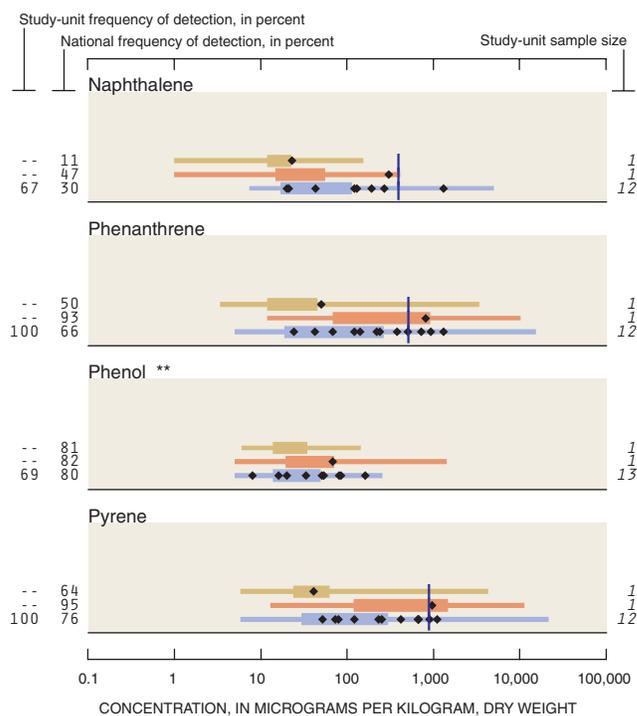
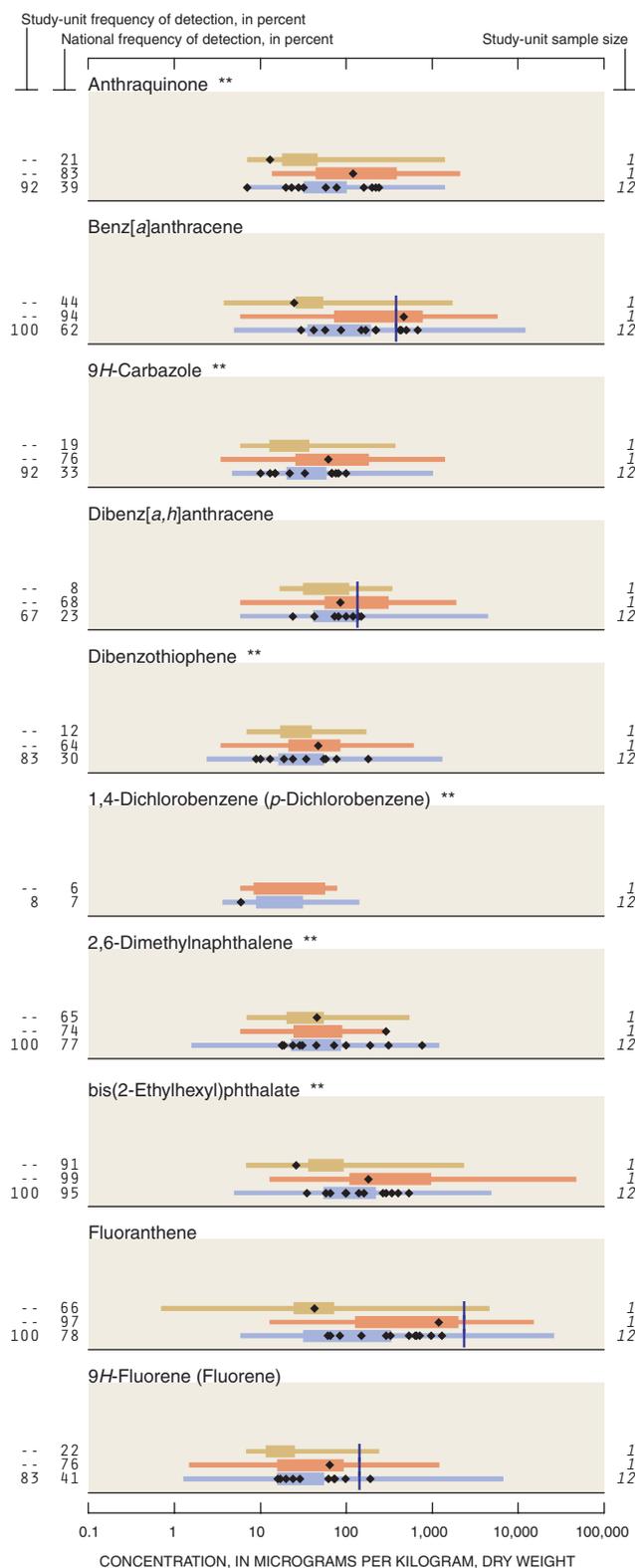
Other organochlorines detected

- o,p'+p,p'-DDT (sum of o,p'-DDT and p,p'-DDT) *
- Dieldrin+aldrin (sum of dieldrin and aldrin) **
- Hexachlorobenzene (HCB) **
- o,p'-Methoxychlor ***
- Pentachloroanisole (PCA) ***
- cis-Permethrin (Ambush, Astro, Pounce) ***
- trans-Permethrin (Ambush, Astro, Pounce) ***

Organochlorines not detected

- Chloroneb (Chloronebe, Demosan) ***
- DCPA (Dacthal, chlorthal-dimethyl) ***
- Endosulfan I (alpha-Endosulfan, Thiodan) **
- Endrin (Endrine)
- gamma-HCH (Lindane, gamma-BHC, Gammexane) *
- Total-HCH (sum of alpha-HCH, beta-HCH, gamma-HCH, and delta-HCH) **
- Heptachlor epoxide (Heptachlor breakdown product) *
- Heptachlor+heptachlor epoxide (sum of heptachlor and heptachlor epoxide) **
- Isodrin (Isodrine, Compound 711) ***
- p,p'-Methoxychlor (Marlate, methoxychlore) **
- Mirex (Dechlorane) **
- Toxaphene (Camphechlor, Hercules 3956) ***

Semivolatile organic compounds (SVOCs) in bed sediment



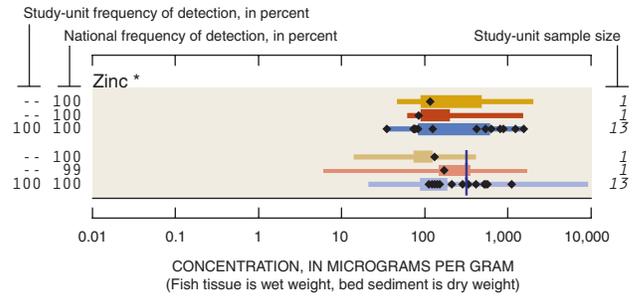
Other SVOCs detected

Acenaphthene
Acenaphthylene
Acridine **
C8-Alkylphenol **
Anthracene
Benzo[a]pyrene
Benzo[b]fluoranthene **
Benzo[ghi]perylene **
Benzo[k]fluoranthene **
Butylbenzylphthalate **
Chrysene
p-Cresol **
Di-*n*-butylphthalate **
Di-*n*-octylphthalate **
Diethylphthalate **
1,2-Dimethylnaphthalene **
1,6-Dimethylnaphthalene **
3,5-Dimethylphenol **
Dimethylphthalate **
2-Ethylanthracene **
Indeno[1,2,3-*cd*]pyrene **
Isoquinoline **
1-Methyl-9H-fluorene **
2-Methylanthracene **
4,5-Methylenephenanthrene **
1-Methylphenanthrene **
1-Methylpyrene **
Phenanthridine **
Quinoline **
2,3,6-Trimethylnaphthalene **

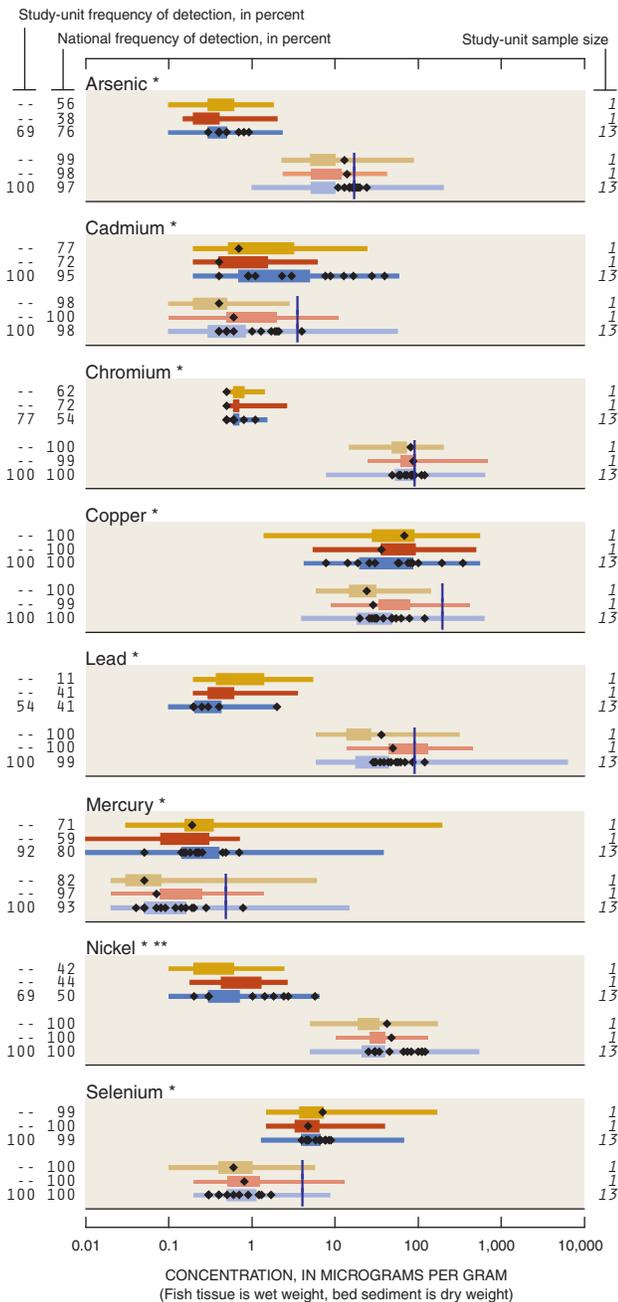
SVOCs not detected

Azobenzene **
Benzo[c]quinoline **
2,2-Biquinoline **
4-Bromophenyl-phenylether **
4-Chloro-3-methylphenol **
bis(2-Chloroethoxy)methane **

- 2-Chloronaphthalene **
- 2-Chlorophenol **
- 4-Chlorophenyl-phenylether **
- 1,2-Dichlorobenzene (*o*-Dichlorobenzene) **
- 1,3-Dichlorobenzene (*m*-Dichlorobenzene) **
- 2,4-Dinitrotoluene **
- Isophorone **
- Nitrobenzene **
- N*-Nitrosodi-*n*-propylamine **
- N*-Nitrosodiphenylamine **
- Pentachloronitrobenzene **
- 1,2,4-Trichlorobenzene **



Trace elements in fish tissue (livers) and bed sediment



BIOLOGICAL INDICATORS

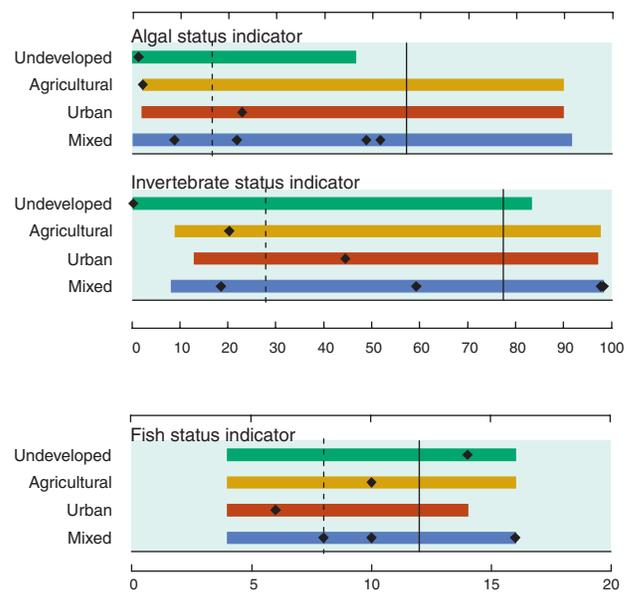
Higher national scores suggest habitat disturbance, water-quality degradation, or naturally harsh conditions. The status of algae, invertebrates (insects, worms, and clams), and fish provides a record of water-quality and stream conditions that water-chemistry indicators may not reveal. **Algal status** focuses on the changes in the percentage of certain algae in response to increasing siltation, and it often correlates with higher nutrient concentrations in some regions. **Invertebrate status** averages 11 metrics that summarize changes in richness, tolerance, trophic conditions, and dominance associated with water-quality degradation. **Fish status** sums the scores of four fish metrics (percent tolerant, omnivorous, non-native individuals, and percent individuals with external anomalies) that increase in association with water-quality degradation.

Biological indicator value, Allegheny and Monongahela River Basins, by land use, 1996–98

- ◆ Biological status assessed at a site

National ranges of biological indicators, in 16 NAWQA Study Units, 1994–98

- Streams in undeveloped areas
- Streams in agricultural areas
- Streams in urban areas
- Streams in mixed-land-use areas
- 75th percentile
- - - 25th percentile



A COORDINATED EFFORT

Coordination with many agencies and organizations in the Allegheny-Monongahela River Basins Study Unit was integral to the success of this water-quality assessment. We thank those who served as members of our liaison committee.

Federal Agencies

- National Park Service
- Natural Resources Conservation Service
- U.S. Army Corps of Engineers
- U.S. Department of Energy
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U.S. Geological Survey
- U.S. Office of Surface Mining , Reclamation and Enforcement

State Agencies

- Maryland Department of Natural Resources
- New York State Department of Environmental Conservation
- New York State Geological Survey
- Pennsylvania Department of Agriculture
- Pennsylvania Topographic & Geologic Survey
- Pennsylvania Department of Environmental Protection
- Pennsylvania Fish & Boat Commission
- West Virginia Department of Environmental Protection
- West Virginia Department of Natural Resources
- West Virginia Geological and Economic Survey

Local Agencies

- Allegheny County Department of Health
- Erie County Department of Public Health and Safety
- Greene County Conservation District
- Seneca Nation Health Department
- Somerset County Conservation District

Universities

- Allegheny College
- California University of Pennsylvania
- Carnegie Mellon University
- Pennsylvania State University
- University of Pittsburgh
- West Virginia University

Other public and private organizations

- Allegheny Watershed Network
- Allegheny County Sanitary Authority
- American Crop Protection Association
- French Creek Project
- Friends of the Cheat
- Jennings Environmental Education Center
- Ohio River Basin Commission
- Ohio River Valley Water Sanitation Commission
- Western Pennsylvania Coalition for Abandoned Mine Reclamation
- Western Pennsylvania Conservancy

We thank the following individuals, agencies, and organizations for contributing to the success of this study

- Property owners throughout the Allegheny and Monongahela River Basins, for granting permission to access their property and to sample their wells.
- Pennsylvania Department of Environmental Protection offices in Ebensburg and Greensburg, Pa., for providing access to mine permits.
- West Virginia Department of Environmental Protection offices in Philippi and Nitro, W.Va., for providing access to mine permits.
- Randy Robinson, for providing white water rafting photographs and rafting guide services on the Cheat River.
- Dick Snyder, Pennsylvania Fish and Boat Commission, for providing access and copies of fish community and survey data.
- Jay Stauffer, Pennsylvania State University and students for assistance with electrofishing.
- Charles Durista, Pennsylvania Department of Environmental Protection, Jay Hawkins, U.S. Office of Surface Mining, and Jen Novak, Allegheny River Alliance, for providing review comments for this report.
- Technical and editorial reviewers in Lemoyne, Pa., Dr. J. Kent Crawford and Bruce Lindsey.
- The Reports Publishing Unit, Kim Otto, James Bubb, and Terriann Preston, in Lemoyne, Pa., for their outstanding efforts in bringing this report to publication.
- Project staff, including seasonal, temporary, student and volunteer staff members of the Pittsburgh office of the U.S. Geological Survey, who assisted in various aspects of this study, including Thomas Noonan, Gregory Wehner, Devon Renock, Erik Eismont, Scott Coulson, Jeffery Weitzel, Greg Hawkins, Jay Hawkins, Craig Uzelac, Douglas Chichester, Adam Locke, Rachel Mowery, Juliane Bowman Brown, and Julie Baldizar.

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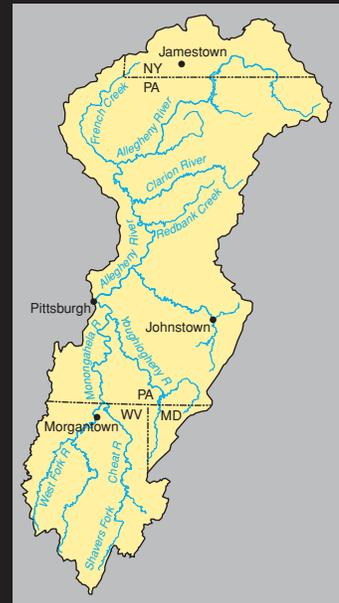
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NAWQA

National Water-Quality Assessment (NAWQA) Program Allegheny and Monongahela Basins



Anderson and others—Water Quality in the Allegheny and Monongahela River Basins
U.S. Geological Survey Circular 1202

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