DENVER, CO

Denver Earned a Water Quality and Compliance Grade of Good in 2000 and 2001

The city had moderate levels of some contaminants, but they generally measured well below national standards.

▶ Denver had no recent reported violations of current, pending, or proposed national standards.

▶ Denver's water contains moderate levels of **haloacetic acids** (HAAs) and **total trihalomethanes** (TTHMs), by-products of chlorine disinfection that may cause cancer. Denver uses chloramines as a disinfectant to keep TTHM and HAA levels down. Still, disinfection by-product levels prevented Denver from getting better than a Good grade for its water quality.

▶ About 2 percent of high-risk Denver homes tested exceeded the national standard for **lead**. Findings do not represent a violation, but they do mean that a significant number of local residents likely have substantial amounts of lead in their tap water. Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior.

Denver's Right-to-Know Reports Earned a Grade of Good

▶ The reports included helpful information on health risks related to lead, turbidity, and total trihalomethanes; its discussion of *Cryptosporidium* and *Giardia* was prominent and detailed; and its warning to immunocompromised people was properly placed in a prominent location at the beginning of the reports. However, the reports included no information on specific known or potential polluters in Denver's watershed and buried mention of the potential cancer risks from trihalomethanes in a footnote.

Denver Earned a Source Water Protection Rating of Good

▶ The EPA's Index of Watershed Indicators gives Denver's major water sources its best rating of 1 on its scale ranging from 1 (lowest threat and vulnerability) to 6 (highest threat and vulnerability). However, according to local experts, a significant threat to Denver's watershed looms: fire and resulting debris and sediment from floods, which can muddy and contaminate the city's water reservoirs.[2] NRDC rated the watershed threat as Good, based upon the up-to-date source water threat information.

Noteworthy

▶ Denver has projected that the city needs $363.5 million in water supply system capital improvements in coming years, including a major water reclamation project, new conduits and storage, improvements to the Marston Plant 1, including a new filter plant, and other improvements to address aging portions of the system and to improve water quality, water production efficiency, and safety.[3] In addition, upgrades are needed for the Marston Water Quality Lab and for the Foothills plant disinfection system and clear water basin.

DENVER
System Population Served **1 million**[1]
Water Quality and Compliance **2000▶Good** **2001▶Good**
Right-to-Know Report—Citizenship **2000▶Good** **2001▶Good**
Source Water Protection **Good**
REPORT CARD

KEY CONTAMINANTS IN DENVER'S WATER

The following contaminants have been found in Denver's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Total Coliform Bacteria

National Standard (MCL)
5% maximum in any month[4]

National Health Goal (MCLG)
0—no known fully safe level

2001 Levels
1% in highest month, total coliform positive[5]

LEVELS PRESENT SOME CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. Denver's levels of total coliform are relatively low and not likely to be of serious concern to healthy people. However, the presence of coliform in the Denver distribution system may be an indication that regrowth of bacteria is occurring in the city's pipes. If unchecked, regrowth can become a serious problem, spurring degradation of water quality and potentially harboring pathogens in the pipes.

INORGANIC CONTAMINANTS

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[6]

National Health Goal (MCLG)
0—no known fully safe level

2000 Levels
8 ppb at 90th percentile level; 2% of homes tested exceeded national standard[7]

2001 Levels
7 ppb at 90th percentile; 2% of homes tested exceeded national standard[8]

LEVELS PRESENT SOME CONCERN

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior, as well as adversely affect blood pressure, red blood cells, and kidney and nervous system function. Denver's lead levels are generally well below the national standard, and only a small number of Denver homes—about 2 percent of high-risk homes tested—have lead levels above the EPA's action level. Consumers, particularly those with infants or young children, may want to test their water for lead; to find a laboratory, contact the Drinking Water Hotline, 800-426-4791. Or consumers may choose to flush faucets of lead by running water for approximately one minute before ingestion. (Excess water may be saved for plants or other uses.)

ORGANIC CONTAMINANTS

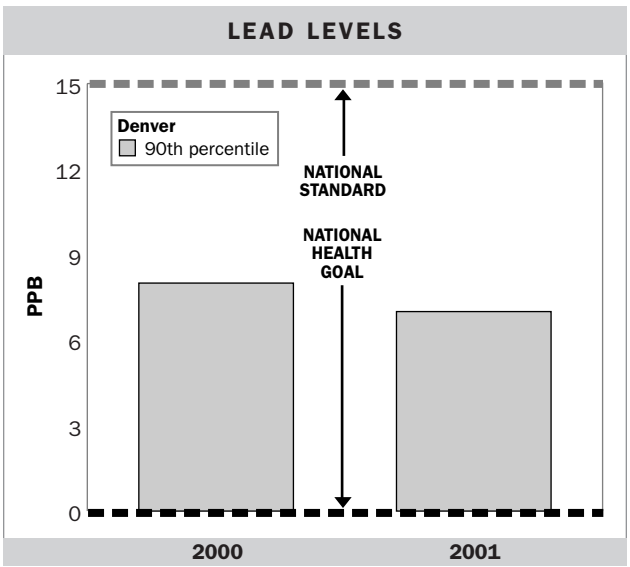
Haloacetic Acids

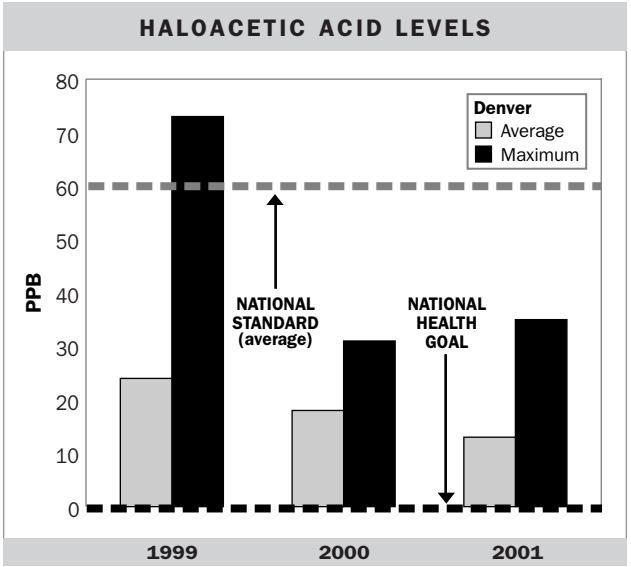
National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard

National Health Goal (MCLG)
0—no known fully safe level[9]

1999 Levels[10]	Average	Maximum
	24 ppb	73 ppb
2000 Levels[11]	Average	Maximum
	18 ppb	31 ppb
2001 Levels[12]	Average	Maximum
	13 ppb	35 ppb

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. Since 1999, Denver's HAA peak levels appear to have dropped as





significantly as the TTHM levels did. As with TTHMs, some of this reduction in peak levels is a result of Denver Water's tightening of operations and treatment system modifications. However, some of the reduction in peaks may also have been due to changes in how the data were collected and reported.[13] Whatever the exact levels are, it is clear that average HAA levels are relatively low—less than half the national standard, even according to the 1999 measurements.

Total Trihalomethanes

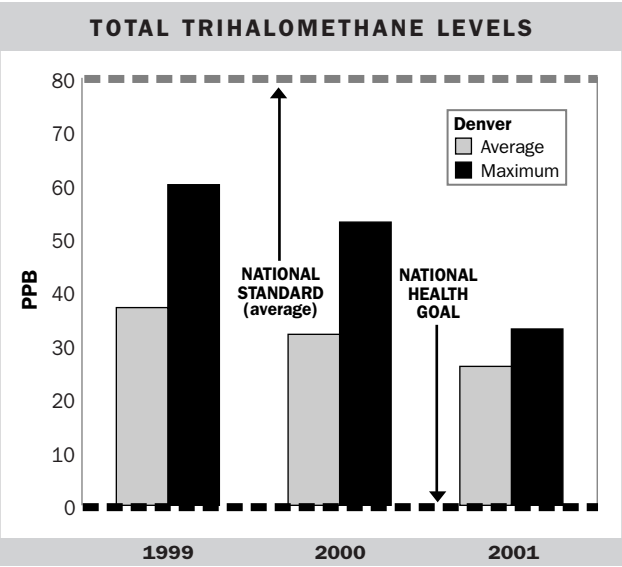
National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

National Health Goal (MCLG)
0—no known fully safe level[14]

1999 Levels[15]	Average 37 ppb	Maximum 60 ppb
2000 Levels[16]	Average 32 ppb	Maximum 53 ppb
2001 Levels[17]	Average 26 ppb	Maximum 33 ppb

LEVELS PRESENT SOME CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects. Based on publicly available data, Denver's TTHM levels appear to have dropped significantly since 1999, when peak levels were reported at 60. While some of this reduction is a result of Denver Water's tightening of operations and treatment system modifications, it is also possible, according to a Denver Water expert, that some of the reduction was due to modest changes in how the data were collected and reported by Denver Water, its contract lab, and the state of Colorado during the relevant years.[18] In any event, Denver's TTHM levels are fairly low, and even the peaks are relatively low compared to many U.S. water systems.



DENVER'S RIGHT-TO-KNOW REPORTS

Denver's Right-to-Know Reports Earned a Grade of Good for 2000 and 2001

On the good-citizen side of the ledger:

▸ The report described, with diagrams, specifics on how the water is treated.

▸ The report included a helpful map of the sources of Denver's water.

▸ Information on health risks resulting from exposure to lead, turbidity, and total trihalomethanes was provided, even though the latter is not legally required. The discussions of *Crypto, Giardia,* and turbidity were prominent and detailed.

▸ The warning to immunocompromised people was properly placed in a prominent location at the beginning of the reports.

On the could-be-a-better-citizen side of the ledger:

▸ The 2000 and 2001 reports included no information on specific known or potential polluters in Denver's watershed, nor do the included maps indicate the locations or types of such polluters. The EPA rules require utilities to name known sources of any specific contaminant found in their tap water.[19] Even where this is not required, or where the specific polluter cannot be tied with assurance to a specific contaminant, the EPA rules encourage water systems to highlight significant sources of contamination in the watershed.

▸ The reports mentioned the potential cancer risk from trihalomethanes, even though the warning was not required (Denver's levels were below the national standard). However, the information was buried in a footnote, and the report suggested such risks were

present only "at or beyond regulated levels"—an incorrect assertion, since low levels still carry some cancer risk. The EPA established a health goal of 0 for some trihalomethanes because there is a cancer risk at any level. Also, the reports do not provide information on the health effects of some other contaminants found at levels below EPA standards but above EPA health goals—such as haloacetic acids and some radioactive contaminants, which are found at low levels in Denver's water. Although not legally required, this information would have assisted local residents in protecting their health and their water.

THREATS TO DENVER'S SOURCE WATER

Denver Earned a Source Water Protection Grade of Good

In its Index of Watershed Indicators, the EPA ranks Denver's South Platte Headwaters and Upper South Platte as 1 on a source water threat scale that ranges from 1 to 6, with 1 representing the highest quality water with the lowest contamination threat.[20] The Moffat source, a portion of the Colorado River headwaters including part of the Fraser River and a few tributaries, also ranks a 1.[21] The Moffat source's South Boulder Creek, and the east-of-the-divide watersheds feeding into the St. Vrain River, also earned ratings of 1.[22]

However, according to local experts, a significant threat to Denver's watershed looms: fire and resulting debris and sediment from floods, which can muddy and contaminate the city's water reservoirs.[23] Fires can denude and destabilize soils in the watershed, causing potentially serious erosion. Streams then can carry into reservoirs large amounts of fine particles, soil, and debris from these hard-hit areas, complicating treatment and clogging a reservoir with sediment, flotsam, and jetsam. According to Donald Thompson of Denver Water's Citizen Advisory Council, "Denver has good control of the watersheds or makes use of watersheds that are in public control, but fire doesn't respect land ownership, and a fire a couple of years ago basically closed down half of the Denver system. The following floods filled one of their reservoirs with a 10- or 15-year amount of debris."[24] Denver reportedly has reservoir capacity to meet a drought for a three-year period.[25] Taking this information into account, NRDC has rated the watershed as Good regarding source water protection.

PROTECTING DENVER'S DRINKING WATER

The following are approaches to treating Denver's drinking water and information on how residents can help protect their local water.

Current Methods of Treatment[26]

Denver Water has three treatment plants. Denver's treatment process involves several steps: coagulation, sedimentation, filtration through layers of sand, coal, or both sand and coal, corrosion control, chloramine disinfection, and fluoridation.

Denver could reduce disinfection by-products (TTHMs and HAAs) and other contaminants with additional treatment. For example, enhanced coagulation, activated carbon, and/or the use of an alternative primary disinfectant such as ozone or ultraviolet light could reduce disinfection by-product levels further. Moreover, ozone or ultraviolet light are far more effective at killing *Cryptosproridium* and some other resistant microbes than is chlorine. Synthetic organic compounds, such as herbicides and pesticides, as well as disinfection by-products, are substantially reduced through the use of granular activated carbon (GAC). Some cities have installed GAC at a cost of about $25 per household per year and have improved water quality, taste, and odor.

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

DENVER

Denver Water Board[27]
1600 West 12th Avenue
Denver, CO 80254
303-628-5973
www.water.denver.co.gov

WATER UTILITY INFORMATION

▶ **Attend meetings of the Denver Water Board** (contact information below). Ask for dates and locations.

▶ **Get involved in the Denver Water Citizens Advisory Council.** Contact Joe Sloan, Denver Water, 303-628-6320, or joseph.sloan@denverwater.org.

▶ **Get involved in source water assessment and protection efforts.** Call Denver Water.

▶ **Learn more from:**

- Clean Water Network, www.cwn.org

Peer reviewers for the Denver report included Gary Steinberg, Clean Water Fund; Robin Hubbard, Colorado PIRG; Joan Steelman, Sierra Club, Colorado; and Dr. Linda Greer, senior scientist, NRDC.

NOTES

1 Environmental Protection Agency, Safe Drinking Water Information System.

2 Personal Communication with Donald Thompson, Member, Denver Water Citizen Advisory Council, April 29, 2002.

3 "Larger Cities Report Capital Improvement Needs," *WaterWorld,* December 2001, available online at www.pennnet.com.

4 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

5 Denver Water, "Water Quality Report 2002" (covering calendar year 2001 data).

6 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

7 Denver Water, "Treated Water Quality Roundup," available online at www.water.denver.co.gov/waterquality/wtrqualityframe.html.

8 See note 4.

9 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

10 See note 7.

11 Denver Water, "2001 Treated Water Quality Roundup," available online at www.water.denver.co.gov/waterquality/wtrqualityframe.html.

12 Denver Water, "Water Quality Report 2002" (covering calendar year 2001 data).

13 Denver Water, "Water Quality Report 2000."

14 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

15 See note 13.

16 Denver Water, "2001 Treated Water Quality Roundup," available online at www.water.denver.co.gov/waterquality/wtrqualityframe.html.

17 See note 3.

18 Personal communication with Maria Rose, Denver Water, August 8, 2002.

19 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator." While EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution and where the water system is aware of the pollution source, the rules require that polluters to be identified.

20 See EPA IWI for Upper South Platte, available online at www.epa.gov/iwi/hucs/10190002/score.html, and for the South Platte Headwaters, available online at www.epa.gov/iwi/hucs/10190001/score.html.

21 EPA IWI, available online at www.epa.gov/iwi/hucs/14010001/score.html.

22 EPA IWI, available online at www.epa.gov/iwi/hucs/10190005/score.html.

23 See note 2.

24 Ibid.

25 Ibid.

26 See note 8.

27 Ibid.