

Distribution of Major Herbicides in Ground Water of the United States

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FOREWORD

The mission of the U.S. Geological Survey (USGS) is to assess the quantity and quality of the earth resources of the Nation and to provide information that will assist resource managers and policymakers at Federal, State, and local levels in making sound decisions. Assessment of water-quality conditions and trends is an important part of this overall mission.

One of the greatest challenges faced by water-resources scientists is acquiring reliable information that will guide the use and protection of the Nation's water resources. That challenge is being addressed by Federal, State, interstate, and local water-resource agencies and by many academic institutions. These organizations are collecting water-quality data for a host of purposes that include: compliance with permits and water-supply standards; development of remediation plans for specific contamination problems; operational decisions on industrial, wastewater, or water-supply facilities; and research on factors that affect water quality. An additional need for water-quality information is to provide a basis on which regional- and national-level policy decisions can be based. Wise decisions must be based on sound information. As a society we need to know whether certain types of water-quality problems are isolated or ubiquitous, whether there are significant differences in conditions among regions, whether the conditions are changing over time, and why these conditions change from place to place and over time. The information can be used to help determine the efficacy of existing water-quality policies and to help analysts determine the need for and likely consequences of new policies.

To address these needs, the U.S. Congress appropriated funds in 1986 for the USGS to begin a pilot program in seven project areas to develop and refine the National Water-Quality Assessment (NAWQA) Program. In 1991, the USGS began full implementation of the program. The NAWQA Program builds upon an existing base of water-quality studies of the USGS, as well as those of other Federal, State, and local agencies. The objectives of the NAWQA Program are to:

- Describe current water-quality conditions for a large part of the Nation's freshwater streams, rivers, and aquifers.
- Describe how water quality is changing over time.

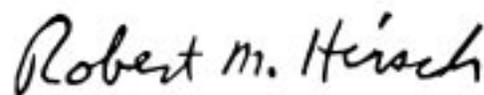
- Improve understanding of the primary natural and human factors that affect water-quality conditions.

This information will help support the development and evaluation of management, regulatory, and monitoring decisions by other Federal, State, and local agencies to protect, use, and enhance water resources.

The goals of the NAWQA Program are being achieved through ongoing and proposed investigations of 59 of the Nation's most important river basins and aquifer systems, which are referred to as study units. These study units are distributed throughout the Nation and cover a diversity of hydrogeologic settings. More than two-thirds of the Nation's freshwater use occurs within the 59 study units and more than two-thirds of the people served by public water-supply systems live within their boundaries.

National synthesis of data analysis, based on aggregation of comparable information obtained from the study units, is a major component of the program. This effort focuses on selected water-quality topics using nationally consistent information. Comparative studies will explain differences and similarities in observed water-quality conditions among study areas and will identify changes and trends and their causes. The first topics addressed by the national synthesis are pesticides, nutrients, volatile organic compounds, and aquatic biology. Discussions on these and other water-quality topics will be published in periodic summaries of the quality of the Nation's ground and surface water as the information becomes available.

This report is an element of the comprehensive body of information developed as part of the NAWQA Program. The program depends heavily on the advice, cooperation, and information from many Federal, State, interstate, Tribal, and local agencies and the public. The assistance and suggestions of all are greatly appreciated.



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CONVERSION FACTORS, WATER QUALITY UNITS, AND ABBREVIATIONS AND ACRONYMS

Conversion Factors

	Multiply	By	To obtain
	foot (ft)	0.3048	meter (m)
	mile (mi)	1.609	kilometer (km)
	pound, avoirdupois (lb)	0.45359	kilogram (kg)

Temperature is given in degrees Celsius ($^{\circ}\text{C}$), which can be converted to degrees Fahrenheit ($^{\circ}\text{F}$) by the following equation:

$$^{\circ}\text{F}=1.8(^{\circ}\text{C})+32.$$

Abbreviations and Acronyms

(Additional information noted in parentheses)

kg/km², kilogram per square kilometer

km, kilometer

lb a.i., pound active ingredient

m, meter

μg/L, microgram per liter

mg/L, milligram per liter

mL/g, milliliter per gram

a.i., active ingredient

CDP, construction data preferred

CDR, construction data required

CGAS, Ciba-Geigy atrazine study

CPWTP, Cooperative Private Well Testing Program

CWSW, community water-supply wells

DEA, deethylatrazine

DIA, deisopropylatrazine

DRASTIC, scoring system for predicting the vulnerability of ground water to contamination

DWA, drinking-water aquifer

ESA, ethanesulfonic acid

GC/MS, gas chromatography/mass spectrometry

H, Henry's law constant

HAL, health advisory level

K_{oc}, soil organic carbon partition coefficient

LUS, land-use study (NAWQA)

MCL, maximum contaminant level

MDL, method detection limit

MMS, Metolachlor Monitoring Study

MWPS, Midwest Pesticide Study

NAWQA, National Water-Quality Assessment (Program)

NAWWS, National Alachlor Well-Water Survey

NPS, National Pesticide Survey

OA, oxanilic acid

PMP, Pesticide Management Plan

RDW, rural domestic wells

SGW, shallow ground water

SUS, subunit survey (NAWQA)

S_w , water solubility

USDA–ARS, U.S. Department of Agriculture–Agricultural Research Service

USEPA, U.S. Environmental Protection Agency

USGS, U.S. Geological Survey