WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY PROGRAMS IN WATER QUALITY—LOOKING TOWARD THE 1990's

[From remarks by Dallas L. Peck, Director, U.S. Geological Survey, February 9, 1989, Interstate Conference on Water Policy.]

Water-quality activities of the USGS address both surface- and ground-water components and emphasize cooperation and coordination that are so critical in dealing with issues and concerns of the Nation's water resources. Surface- and ground-water resources cannot be dealt with in isolation without consideration for their fundamental interrelation in the hydrologic cycle. This same connection and cohesion must be reflected in our policies and in our programs because issues related to water quality will become even more critical in the coming years as the pressures on our water resources increase. The pilot National Water-Quality Assessment (NAWQA) Program of the USGS has been developed to better understand the quality of water resources across the country, both surface and ground water, in order to develop truly effective programs and policies to meet our Nation's water-quality concerns.

THE NAWQA PROGRAM CONCEPT

Seven pilot projects have been selected to test and refine concepts for a possible full-scale assessment program. As presently envisioned, the proposed full-scale program will be accomplished through investigations of aquifer systems and river basins across the country that will represent a large part of the Nation's water use. Each of these study units will provide information useful to States and localities in addressing their water-quality problems. A national assessment will be developed from that same information base by aggregating and comparing results from all the study units.

EARLY INTERPRETIVE RESULTS

What has been learned thus far from the pilot projects is encouraging—both from the standpoint of knowledge gained and as a validation of our belief that this is the right approach to provide a broad foundation on which to build an understanding of water-quality issues nationwide. Trends over time are particularly critical in dealing with issues of water quality. We need to be able to see not only what changes have occurred in the quality of our water resources but also how those changes have occurred—how rapidly or how slowly and how extensive or restrictive their effect has been.

The present stage in the pilot program is of intensive data collection and interpretation. Some initial interpretive results are instructive:

- Upper Illinois River basin—In the Chicago region, and also in more rural parts of the basin, the occurrence of synthetic organic compounds is more widespread than expected.
- Lower Kansas River basin—The herbicide atrazine has been detected in streams throughout the basin during base-flow conditions.
- Central Oklahoma aquifer—The spatial distribution of arsenic, selenium, and naturally occurring radionuclides is being defined to help avoid the drilling of wells in areas likely to exceed water-quality standards for these constituents.

A key aspect of these studies is to provide a solid base of existing data, including newly collected data, to make maximum use of our resources.

NAWQA AND OTHER COOPERATIVE PROGRAMS

The scope of the assessment program deals with water quality at local, regional, and national scales. There are valuable insights to be gained at each scale, and several other water-quality initiatives, each in regard to its particular scale and from the particular insight that scale provides, are discussed below.

LOCAL-SCALE STUDIES

Studies of trace-metal contamination in a river reach or of a contaminant plume from a hazardous-waste disposal site are good examples of a local-scale study. We have been providing information to help other agencies make decisions about the safe disposal of hazardous wastes for more than a quarter of a century. For example, one of our earliest detailed plume studies, which was published in 1963, delineated cadmium and chromium contamination of shallow ground water on Long Island resulting from metal-plating wastes.

Our understanding of the processes that govern the fate and transport of hazardous substances in ground and surface water has improved substantially through the USGS **Toxic Substances Hydrology Program,** particularly through several intensive, interdisciplinary field investigations. These address specific types of ground-and surface-water contamination. In ground water, we have been investigating contamination by crude oil and its derivatives, sewage, and chlorinated hydrocarbons, creosote wastes, and an acidic plume from copper mining. In surface water, we have been investigating contamination from petrochemicals, trace elements, and acid-mine drainage.

These field investigations have yielded many insights about the characteristics of contaminants in the environment. For example, several of the ground-water studies have shown that microbes in the aquifer system can degrade selected organic compounds and can retard their movement to within very short distances of the plume source. At a Cape Cod, Mass., site, where we are intensively investigating ground-water contamination

from sewage disposal, we have found that some organic contaminants have persisted in the ground water for more than 30 years. From studies at the surface-water sites, USGS scientists have discovered that daily fluctuations of pH and photochemical reactions and interactions with natural organic compounds all can exert important controls on contaminant movement.

REGIONAL-SCALE STUDIES

A large part of the regional water-quality studies are conducted in cooperation with State and local agencies through the **Federal-State Cooperative Program.** These include both studies of naturally occurring substances, such as radon and other natural radionuclides, and studies of human-introduced substances, particularly agricultural chemicals. The USGS also operates many long-term water-quality monitoring networks through the Cooperative Program. These networks are the core of monitoring programs in some States.

Much of the recent focus of the **Toxic Substances Hydrology Program** at the regional scale is directed toward a study of herbicides in the corn/soybean belt of the mid-continent region of the U.S. Considerable interest has been expressed by the **States,** the **Department of Agriculture** (DOA), and the **Environmental Protection Agency** in working with us in this region. For example, the DOA has begun a major water-quality initiative that focuses on the same mid-continent area. Collaborative work is planned at selected study sites to combine DOA expertise in agricultural practices and in processes occurring in the soil and root zones with USGS expertise in the underlying unsaturated and saturated zones. This type of cooperative effort that draws together several government agencies and draws upon the specific scientific expertise of each is a model for the type of coordination that will be instrumental in addressing future water-quality problems.

NATIONAL-SCALE STUDIES

The USGS operates three national-scale surface-water-quality networks. The first, the National Trends Network, is operated as part of the **Acid Rain Program** and consists of 150 stations for collecting atmospheric deposition across the U.S. This network is designed to reflect regional characteristics of precipitation chemistry without the effects of local sources of air pollution.

The second network, the Hydrologic Benchmark Network, consists of 53 surface-water stations operated in relatively small, pristine watersheds. This network was established in the early 1960's and provides information about "near natural" water-quality conditions where humans have little direct influence on the water resources. In using data from the Benchmark Network to look at the effects of atmospheric deposition on water quality, relatively strong correlations were shown between long-term trends in sulfate concentrations in streams and regional trends in sulfur dioxide emissions.

The third network, the National Stream Quality Accounting Network (NASQAN), was started in 1972 and presently consists of 412 stations located on large to moderately large rivers widely distributed among the 50 States, Puerto Rico, and the Virgin Islands. NASQAN data indicate, for example, widespread increases in nitrate concentrations in the Nation's rivers since the network was established. Increased nitrate concentrations result in more nitrate being carried to estuaries and coastal waters; this is of particular concern because of the tendency for nitrogen to stimulate algal growth in coastal environments. Data indicate also that atmospheric nitrogen from fossil fuel combustion contributes significantly to nitrate levels in many of the Nation's estuaries. This is particularly relevant to estuaries such as the Chesapeake Bay where there is a strong commitment to reduce nutrient loads to the bay by the year 2000.

GLOBAL-SCALE STUDIES

The final scale step, of course, is that of a global perspective. There is much that the USGS can contribute toward that understanding, and we have a major initiative on climate-change hydrology. One component of the program will be studies of selected basins to help in long-range planning for river basins in the face of possible climate change. A pilot effort is currently underway in the Delaware River basin that includes an evaluation of possible changes in climate on the upstream movement of saline water in the Delaware estuary and the resulting salt-water intrusion into aquifers adjacent to the estuary.

NOW AND INTO THE FUTURE

Many classes of contaminants and environmental settings in which contamination is occurring remain to be studied. During the 1990's, we anticipate expanding our efforts to include contiminants moving through fractured-rock aquifers, gasoline contamination in ground water, and ground-surface-water systems contaminated by complex mixtures of organic and inorganic chemicals.

The USGS has had an increased role during the 1980's in studies that characterize water-quality conditions across areas of hundreds to tens of thousands of square miles. Because of increased concerns about nonpoint sources of contamination, this trend is expected to continue into the 1990's.

A decision about proceeding to full-scale implementation of the NAWQA Program probably will be made in 1990. The decision will be based on the responses of a wide range of potential users. For each of the pilot projects, liaison committees have been formed to address the needs and concerns of local, State, and Federal interests. In addition to the individual liaison committees, there is a national committee to advise on the overall pilot program. There is also an ongoing evaluation of the design and potential use of the program by a committee of the National Academy of Sciences that will be a central element in the final decision process. It is through efforts such as these, and the many other effective Federal-State, government-industry, and public-private partnerships that are operating nationwide, that we can deal with concerns about our Nation's water resources.

For more information on the National Water-Quality Assessment Program, contact:

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