

CASE STUDIES IN RURAL GROUNDWATER MANAGEMENT

The third and fourth program components are necessarily related. The purpose of delineating water resource management areas was to identify and specify valuable and/or vulnerable water sources where regulatory measures for quality and quantity protection are to be applied. The county conducted the work in each of the eight towns, mapping the following four management areas: wellhead protection areas, aquifer recharge areas, surface watershed areas, and carbonate rock areas.

Using landmark state-enabling legislation authorizing Carroll County to "develop, administer, and enforce a program to protect ground and surface water resources through land use ordinances, regulations, resolutions, or policies..." progressive land use regulations have been drafted. The regulations are based on concept-of-performance standards and designed to accomplish the goals set forth for water resource protection, while at the same time allowing for the prudent, managed growth and development of towns and the county.

Cooperation as a policy initiative in Utah

By R. Peralta and A. Peralta

UTAH is an arid state, largely reliant upon groundwater. Most precipitation falls in the higher elevations of the Unita and Wasatch Mountains of northern and central Utah. Much of this precipitation ultimately becomes groundwater, stored in alluvial aquifers at the base of these ranges. The vast majority of pumping wells draw water from these deposits (2).

About 63 percent of Utah's population depends to some degree upon groundwater for domestic use. In many rural areas, groundwater is the sole source of water for domestic, irrigation, and stock uses. In these cases, agricultural chemicals, septic system effluents, leachate from mine tailings, and natural processes are all sources of groundwater contamination.

The issue of assuring the long-term availability of groundwater of adequate

The overall philosophy guiding the development of the Carroll County program can be summed up in four tenants:

► Water resource management must be viewed as an integrated, dynamic, *comprehensive* effort, encompassing both surface water and groundwater, addressing both quality and quantity.

► The most cost-effective, environmentally responsible and politically sound approach to resource management is a policy of *protection* and *prevention*, rather than its more popular sibling, *management by crisis and remediation*.

► *Enlightened land use planning and regulation* are among the most effective tools available to local governments to promote prudent water resource management.

► Acknowledging that water serves many masters—domestic supply, agriculture, recreation, industry and commerce, natural habitats, and transportation—enables policymakers to *equitably balance* growth pressures and land use demands with environmental sensitivity and resource management. □

of stratification, that is, the tendency of members of different agencies to protect and expand their turf (11).

In Utah, external stimuli include the lack of significant funding for rural groundwater quality concerns and impetus from the executive arms of the federal and state governments. For example, in 1984, then Governor Scott Matheson issued an executive order outlining a state groundwater policy and requiring "the coordination of affected agencies and interested parties" in policy formation and implementation. In addition, a 1988 memorandum of understanding between the Soil Conservation Service (SCS) and Extension Service (ES) clearly stated that cooperation and coordination between agencies was to be the way of the future. As a result, the existing Utah Nonpoint-Source Coordinating Committee has taken on a fresh perspective.

Policy features and programs

Giving cooperation the rank of a policy objective facilitates the achievement of stated water quality objectives. The keys to making mandates, such as the governor's statement and the memorandum of understanding, effective are the interagency, interorganizational, and interpersonal relationships that exist and evolve over time. Efforts to defuse potential conflicts should be an important part of public policy initiatives.

Three variables in working successfully together are the broadness of the base of participation, the level of trust, and "the relative willingness of participants to share information with the other players" (10). The Utah Nonpoint-Source Coordinating Committee has used some innovative ideas to address all three issues. In this process, the committee coordinates training for agency personnel, decision-makers, and the general public; coordinates development of common reference materials by all involved agencies; provides evaluation criteria for cooperative, interagency county water quality programs; and recognizes (rewards) accomplishments of cooperative interagency efforts at the county level.

Broadening the base of participation. The committee recently was expanded to allow a broader base of participation. Founding representatives are from the Utah Department of Agriculture, Utah Department of Health and Natural Resources, Utah Association of Conservation Districts, SCS, and the Cooperative Extension

quality and quantity is so legally, technically, and socially complex that no one level of government can satisfactorily address it. The need for a coordinated, cooperative approach is never so obvious as in the case of water policy and perhaps never so difficult to achieve. The statutory and adjudicated division of responsibilities between federal, state, and substate governmental entities rarely is based upon hydrologic reality. Aquifers are not neatly confined within geopolitical boundaries. In addition, the rather artificial and frequently overlapping lines of responsibility for groundwater quality have created a cumbersome, stratified organizational structure (8).

Tension, competition, and conflict too often accompany interagency and intergovernmental efforts to coordinate operational policy objectives. Although most involved players recognize the efficacy of combining resources and coordinating efforts to address large-scale problems (5, 9), some external impetus may be required to overcome the negative effects

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sion Service. The committee is now open to public participation, including representatives of farm organizations and environmental groups.

Public education efforts must be an integral part of broadening participation in groundwater quality issues. Yet, numerous studies indicate that the users and potential polluters of groundwater feel underinformed about the consequences of their actions and about viable alternatives. The Freshwater Foundation (4) in polling attendees at a native agricultural chemicals and groundwater protection conference, found that 80 percent of the participants felt that insufficient information was available to "allow for effective management of agrichemicals and protection of groundwater." Ninety-one percent felt that what information was available was "not getting to the right people."

Analyses of educational programs to inform the public about water quality issues indicate that extension personnel can be effective with the right program emphasis. Mancl, Sharpe, and Makuch (6) found in-service training and a clinic format to be effective for disseminating water quality information to their Pennsylvania public. In cooperation with the Nonpoint-Source Coordinating Committee, ES training programs are being refined to address the increasing importance of water quality issues in Utah.

Methods for educating the public and encouraging private water supply sampling and analysis are being compared. One technique involves standard ES practices of holding workshops for volunteer participants. The other involves the use of public school workshops by in-service teachers. The comparison will demonstrate which is more efficient in terms of motivating people to test their private water supply and to complete a self-help checklist.

Increasing the level of trust and shared information. Efforts to improve the level of trust and the exchange of information have included encouraging personnel from different agencies to carpool together to meetings to become better acquainted; exchanging reference and planning materials, such as SCS field office technical guides; and widely distributing "Issues on Water Quality," a newsletter informing readers about everything from a videotape library to training and awards programs. In March 1989, three-day water quality workshops were held in each of three towns for agency personnel. The work-

shops reemphasized agency cooperative roles and provided technical training, familiarized personnel with the policies and procedures of cooperating agencies, and provided each participant with a Utah Nonpoint Water Quality Handbook, prepared under the leadership of the Utah Department of Agriculture, with input from other agencies. The handbook includes memoranda of understanding, regulations, fundamentals of water budgets and chemical transport, information on agricultural chemical use in Utah, and guidelines on nonpoint-source pollution prevention and control. Also included are addresses and phone numbers of personnel involved in water quality at county, regional, state, and federal levels.

The coordinating committee, in cooperation with the governor's office, has instituted an awards program to encourage cooperation between and among agencies and individuals at the county level. One overall award and six awards for excellence will be presented annually for the best education and action (remedial or prevention) programs in the sectors of agricultural, domestic, and industrial water quality. All participants from a winning county, whether volunteer or agency-affiliated, will be cited. To minimize administrative time, completed awards application forms substitute for other currently required agency reports. Awards will be given annually in September at a two-day nonpoint-source water quality conference and training session.

County water quality coordinating committees have been formed to deal with both point- and nonpoint-source issues. Members receive site-specific aid as needed from all agencies participating in the state coordinating committee. County and state personnel increasingly have emphasized identification of existing and potential water quality problems and solutions. Information on crops, cropping patterns, and pesticide usage has been obtained for all counties. Hydrogeological and soil screening, followed by computer simulation and comparison with health standards (1, 3, 7), has indicated those site and chemical combinations that pose the greatest potential health hazard. Graphical representation of the relative risk posed by alternative pesticides is being provided to give users a frame of reference for voluntarily reducing the potential for pollution.

Screening for nitrate contamination of groundwater is also underway. The De-

partment of Agriculture purchased easy-to-use kits to test for nitrate contamination and placed them in each county extension office. Agents were trained to use the kit and will test submitted samples. Samples showing high contamination levels will be subsequently tested using more accurate techniques.

Fertilizer management guidelines to reduce the potential for groundwater contamination are being developed. The results of these activities will be disseminated through the coordinating committee.

In sum

Planning and implementation of policies addressing groundwater quality can be impeded by poor intergovernmental and interorganizational relationships. By using a knowledge of organizational dynamics and treating cooperation as a policy objective as well as a means of achieving other goals, Utah officials and citizens have found that such relationships can be improved significantly.

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