Non-Point Water Quality Concerns — Legal and Regulatory Aspects

Proceedings
of the
1989 National Symposium

December 11-12, 1989
New Orleans Marriott
New Orleans, Louisiana

Published by
American Society of Agricultural Engineers
2950 Niles Road • St. Joseph, Michigan 49085-9659 USA

COORDINATING INSTITUTIONAL APPROACHES TO ASSURE SUSTAINABLE GROUNDWATER OF ADEQUATE QUALITY AND QUANTITY IN UTAH

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Utah is an arid state, without the abundant surface water resources enjoyed by states in the humid east. Most precipitation in the state falls in the higher elevations of the Uinta and Wasatch mountains of northern and central Utah. Much of this precipitation ultimately ends up in alluvial deposits at the base of these ranges, from which the vast majority of pumping wells draw their water (Barnes and Croft, 1986). This groundwater is an essential resource for use by the people of Utah. About sixty-three percent of Utah's population is at least partially reliant on groundwater for domestic use. In many rural areas, groundwater is the sole source of water for domestic, irrigation and stock purposes.

Unfortunately, degradation of groundwater quality occurs in both rural and urban areas. Urban runoff, sewage lagoons, agricultural chemicals, salinity, feedlots, industrial and other hazardous wastes, mining operations, oil and gas operations, and septic tanks are some of the threats to Utah's groundwater. Recognizing that groundwater, once contaminated, may be difficult or impossible to return to its previous level of purity, in 1984, then-governor Scott Matheson issued an Executive Order outlining the Utah groundwater policy. The order reiterates the statutory authority and responsibilities of various state agencies, including a charge that the "quality of groundwater will be protected to a degree commensurate with current and probable future uses. Preventative measures will be taken to minimize contamination of the resource so that future public and private uses will not be impaired." The Department of Health is required to "develop a groundwater quality strategy for the protection of present and future public and private uses" with "the coordination of affected agencies and interested parties and with public involvement." Every effort to protect the water quality that existed in 1984 is to be made.

Assuring long-term availability of adequate groundwater resources requires coordinating the actions of many agencies. Included are extension, technology transfer, research and planning activities of state and federal agencies. The purpose of this paper is to describe one cooperative interagency program being used in Utah. By coordinating the efforts of different agencies and individuals, the chance for each agency to accomplish its missions in this area is enhanced. Avoiding duplication and coordinating efforts is essential in Utah because of the dearth of public funds for water resources planning and management.

The paper is organized roughly chronologically in sections describing institutional, technical and educational activities, respectively. The division of activities into institutional, technical and educational categories is for ease of discussion and analysis, and is not meant to designate mutually exclusive task groupings. The three categories do

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accurately indicate the complexity of the issues involved. There is a certain amount of overlap between the sections and some activities could be placed in more than one category. Figure 1 summarizes activities from September 1988 through March 1991.

	1988		1989						1990						1991	
	S	N	J	M	M	J	S	N	J	M	M	J	S	N	J	M
Coordinated Institutional Activities																
Form Ext. Water Qual. Task Force	X															
Declare Intention of Cooperating		X														
Expand Utah NPS Coordinating Committee		X														
Present Interagency Training Workshops			X													
Distribute Utah Water Quality Guidebook			X													
Prepare Abbreviated SCS FOTG			X													
Establish Criteria for County Awards				X												
Publish Interagency Newsletter				X												
Publish Interagency Fact Sheets, etc.				X												
Form County Water Quality Coord. Comm.				X												
Aid County Committees				XXXXXXXXXXXXXXXXXX												
Recognize Best NPS County Programs											X					X
Coordinated Technical Activities																
Continue Existing NPS Actions	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX															
Determine Current Quality Problems			XXXXXXXXXXXXXXXXXXXXXXXXXXXX													
Determine Cropping Areas and Pesticides	XXXXXXXXX															
Identify Regions with Greatest Risk		XXXXXX														
Refine Ranking for Site/Pesticide Combos		XXXXXX														
Report and Map Most Hazardous Combos			XXXX													
Identify Best Sampling Wells				XXX												
Conduct Sampling and Analysis					XXXXXXXXX											
Develop Improved Management Strategies				XXXXXXXXXXXXXXXXXXXXXXXXX												
Present Improved Management Guidelines					X			X			X			X		
Screen Private Water Sup. for Nitrates				XXXX												
Conduct More Detailed Sampling				XX												
Develop Sustained Yield Models & Strat.	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX															
Coordinated Educational Activities																
Train Agency Personnel			X		X			X			X			X		X
Train Teachers				XXX												
Educate Children and Families				XXX												
Educate Water and Chemical Users	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX															

Fig. 1 Accomplished and Planned Activities

The term "institutional" has been variously applied in the field of public administration. Fox (1976) defines an institutional arrangement as an "interrelated set of entities and rules that serve to organize society's activities so as to achieve social goals." The relevant social goal in this case is efficient planning and management for water quality in Utah. The entire set of entities and rules governing water quality issues in the state is beyond the scope of this investigation. For the purposes of this paper, activities labeled "institutional" are limited to specific inter-organizational efforts undertaken to address water quality issues. The technical and educational categories are self-explanatory.

COORDINATED INSTITUTIONAL ACTIVITIES

Groundwater quality and other environmental issues are so legally, technically, and socially complex that no one entity can satisfactorily address them. The statutory and adjudicated division of responsibilities between federal, state and local entities is rarely based on hydrologic reality. Aquifers do not neatly confine themselves within county boundaries and even experts disagree about the effects certain actions may have on the resource. The need for a coordinated cooperative effort is never so obvious as it is in the case of water policy. By combining resources and coordinating activities within a variety of organizations, large scale problems can be adequately addressed (Peralta, et. al., 1984; Mahon, et. al., 1989).

The key to developing and implementing effective policies for dealing with complex public issues may often be the interagency and inter-organizational relationships that exist and evolve over time. The framework for these interactions is often cumbersome and may serve more as a deterrent than an aid to adequate policies being applied (Peralta, A. W., 1982). Some effort to diffuse potential conflicts between organizations is, therefore, an important goal. Two important variables involved in working together are the level of trust and "the relative willingness of participants to share information with the other players" (Stephenson and Pops, 1989). Some of the efforts in Utah have been designed to increase both the level of trust and the interchange of information between the people involved.

Coordinated actions addressing water quality concerns in Utah increased after a 1988 Memorandum of Understanding (MOU) between the Soil Conservation Service (SCS) and Extension Service (ES). That federal document clearly stated that cooperation and coordination between agencies was to be the way of the future. The ability to cooperate was enhanced when ten SCS and ES personnel from Utah attended the regional Water Quality Workshop sponsored by the U.S. Dept. of Agriculture (USDA) in Fort Worth in October 1988. These personnel cooperated well and planned actions as prompted by the workshop leaders.

One of the first ES actions was to establish an Extension Water Quality Task Force composed of about ten specialists involved with subjects affecting water quality. Specialties range from home economics, education, and 4-H through the natural and agricultural sciences, landscape architecture and engineering. The Task Force is to identify and address supportive education and research needs and to provide training for agency personnel and decision makers.

ES leaders were not alone in wanting interagency cooperation. As indicated, the Utah Department of Health had been charged in 1984 with working to coordinate water quality efforts and in January of 1989 leaders of the SCS, Utah Departments of Agriculture (UDA) and Health (UDH) and the ES held a statewide teleconference. They proclaimed the intent that their respective organizations cooperate, and try to solve contamination problems together. Attending the teleconference were all appropriate county ES agents and SCS personnel from the state office and field offices. SCS and ES personnel were told to ride together to the teleconference sites to get to know each other better--a prelude to cooperation. In retrospect, it might have been more effective to tell attendees beforehand that the major goals of the meeting were to have them meet each other and to convince them that cooperation was becoming more important. That might have increased the car pooling and interaction that occurred.

As a result of the encouragement for cooperation, an existing Utah Nonpoint Source Coordinating Committee (NPSCC) was expanded. Founding representatives are from the Utah Department of Wildlife Resources (UDWR), UDA, UDH, Utah Association of Conservation Districts (UACD), SCS, and the Extension Service. The Farm Bureau and other interested individuals and organizations are expected to become involved in the future. Purposes of the committee are: (1) to coordinate a training program for agency and involved persons and

decision makers; (2) to coordinate development of common reference materials for use by all involved agencies; (3) to provide evaluation criteria for cooperative/interagency county water quality programs; and, (4) to recognize (reward) accomplishments of cooperative/interagency county efforts.

In the weeks after the teleconference, members of the NPS Coordinating Committee and an ES Water Quality Task Force met concerning water quality training needs for their personnel. A Utah-specific version of the national Water Quality Workshops was planned. Then ES Specialists and their SCS discipline counterparts decided who should present each topic in the Utah workshop.

In March 1989, a three-day water quality workshop was held in each of three towns in Utah. The workshops were well-distributed throughout the state; one was held in the north central part of the state, one in the south central and one in the east. Together, these required five days. The trainers moved to the next town after giving their presentations. Over one hundred and fifty agency personnel attended. Purposes of the workshop were:

- to reemphasize agency cooperative roles,
- to provide motivation,
- to provide preliminary training to agency personnel concerning physical fundamentals of water quality problems,
- to provide information on current water quality problems in Utah,
- to provide preliminary information on how to reduce or prevent water quality problems in Utah,
- to familiarize agency personnel with the policies and procedures of cooperating agencies,
- to provide common reference materials and knowledge of available reference materials for personnel of cooperating organizations, and
- to help SCS personnel in updating their Field Office Technical Guides to include water quality considerations.

For motivation, agency leaders spoke in person and Governor Norm Bangerter encouraged cooperation via a videotape. Other speakers included scientists, engineers and specialists from SCS, ES, Utah Departments of Agriculture and Health, and the Utah Association of Conservation Districts. Attendees included people from those agencies and others. Further workshops are planned to be presented twice annually to update participants on improved water and chemical management guidelines as they are developed.

Workshop participants received a Utah Nonpoint Water Quality Handbook, prepared with input from cooperating agencies under the leadership of the UDA In some ways the Handbook is similar to the notebook distributed at the USDA sponsored workshop. It includes Memoranda of Understanding between the Extension Service and Soil Conservation Service and between the SCS and EPA, appropriate regulations, fundamentals of water budgets and chemical transport information on agricultural chemicals used in Utah and guidelines on NPS prevention and control. It also contains addresses and phone numbers of agency personnel involved in water quality at county, regional and state levels. This will aid future county-level cooperation.

To the extent possible, it is desirable for all agencies to have access to each other's reference and planning materials. However, a Field Office Technical Guide used in an SCS field office can be voluminous--even filling a book shelf. Maintaining the currency of such a reference might be impractical for ES personnel. Therefore, the SCS helpfully prepared an abbreviated guide for distribution to ES county offices and other agencies.

To further promote cooperation and reduce turf battles, the Nonpoint Source Coordinating Committee (NPSCC), in cooperation with the Governor's office, has instituted seven Governor's awards to be given annually to the counties having the best water quality programs. All participants from a winning county will be recognized, regardless of which organization they are affiliated with or

whether they are paid or volunteer labor. One overall award and six awards for excellence in specific areas of concern will be presented at an annual water quality symposium. The six awards include the best educational and action programs in the sectors of a) agricultural, b) domestic and c) industrial water quality. Educational activities are self explanatory. Action activities include those that create data or cause changes. All counties must complete the application forms for awards. The data reported on these forms is necessary for reports already required by the cooperating organizations. This will minimize the time required to complete the forms and should not require an additional data collection step from agency personnel.

The NPSCC is also publishing new materials and updates to the Handbook. New materials include a water quality newsletter and fact sheets. The purpose is to apprise interested private citizens and agency personnel of newly available information and NPSCC activities. The fact sheets are reviewed by personnel of appropriate agencies and utilize the ES publications system.

As a result of the county awards program, County Water Quality Coordinating Committees (CWQCC) were formed. These have responsibility for both point and nonpoint source issues. Although these committees have some members in common with existing resource conservation district committees, responsibilities are more diverse. They receive site specific aid from agencies participating in the NPSCC as needed.

COORDINATED TECHNICAL ACTIVITIES

As mentioned, agencies have been cooperating in NPS remediation in Utah since before the emphasis to coordinate SCS and ES activities. That cooperation has continued and involves all those previously mentioned as well as the Bureau of Land Management, the Bureau of Reclamation, the U. S. Forest Service, the Utah Bureau of Water Pollution Control, the Utah Division of Water Resources, the State Engineer, the Utah Department of Natural Resources and Energy, the Farmers Home Administration, the Agricultural Stabilization and Conservation Service, the Utah Geological and Mineral Survey, the Governor's Planning Office and state and private forestry groups.

The UDA is the lead agency in the implementation of NPS programs in the state. Their responsibilities include:

- assessment of resources as they relate to NPS impairment in each watershed,
- determination of cost effective alternatives for controlling NPS,
- development of control measure implementation schedules,
- dissemination of information to the public and assurance of public involvement, and
- development of monitoring plans to measure conservation systems impact on NPS control measures.

Activities begun since 1988 include those mentioned below. First, there has been increased emphasis in identifying current water quality problems. To do this ES, SCS and other personnel have queried each other and personnel from other agencies, including the U. S. Geological Survey (USGS). This aids in focussing on the most important problems in each county and in future assessment and documentation of beneficial results of various efforts.

The UDA is responsible for sampling of groundwater for contamination by pesticides. Sampling and analysis is costly so the UDA and the ES are cooperating in determining where best to sample. An initial step was determining cropping areas and the pesticide use practices for those areas. This was coarsely accomplished by surveying county extension agents.

Subsequently, the DRASTIC (Aller et. al., 1985) methodology was utilized as a preliminary screening tool to identify locations with a high risk of contamination. Then the CMLS (Nofziger and Hornsby, 1988) model was used to

simulate vertical movement of pesticide to groundwater for selected site/pesticide combinations. The results have been reported in tabular and map form (Eisele et. al., 1989) and have been distributed to ES, SCS and other personnel. (Digitized maps were prepared in collaboration with the Utah office of Automated Geographical Representation.) Results aid SCS and ES personnel in knowing where the greatest caution should be exercised.

Those wells most likely to show pesticide contamination were selected from those regularly sampled by the USGS. This was done by reviewing the direction of groundwater flow, the depth of well screening and the relative risk of site/pesticide combinations. Sampling and analysis is currently underway.

After realizing that there is significant potential for pesticide contamination of groundwater in some locations, ES and UDA began determining how much this potential can be reduced by improved chemical and water management. Results from this effort, tailored to the highest risk locations in the state, will be forthcoming in early 1990. These results will be published in fact sheet format and as a report. Similar studies are evaluating how to reduce NPS pollution from nitrates and salts by improved management.

Screening for nitrate contamination of groundwater is also underway. The UDA has purchased easy-to-use kits to roughly test for nitrate contamination. These will be placed in County Extension offices. An ES specialist will hold a domestic water workshop for interested parties in those ES county offices receiving a kit. County agents will be trained in use of the kit and will be able to test samples brought in. Samples showing high contamination levels will be subsequently tested using more accurate techniques. Fertilizer management guidelines to reduce the potential of groundwater contamination will be developed.

A fairly complex effort is also underway to assure the sustained availability of groundwater of adequate quality and quantity in Salt Lake County. An optimization model has been developed for computing the maximum sustained yield of groundwater likely for the Salt Lake Valley. This valley has an overdraft problem as well as an extensive groundwater quality problem. This model will be used to determine how to use groundwater without increasing groundwater quality problems. Similar models are being developed for other areas with groundwater overdraft problems.

COORDINATED EDUCATION ACTIVITIES

Public education must be one of the major thrusts of any program having a lasting effect on groundwater quality. Numerous studies indicate that the users of groundwater and the potential nonpoint source polluters of groundwater feel under-informed about the consequences of their actions and about viable alternatives. The Freshwater Society (1987) polled attendees at the Agricultural Chemicals and Groundwater Protection Conference, which they sponsored in cooperation with EPA, the National Agricultural Chemicals Association, the SSC, ES, and others. Some eighty percent of participants felt that insufficient information was made 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." It was also concluded by more than half of the participants that the SCS and ES should do more to cooperatively inform farmers and others including "pesticide and fertilizer dealers, community groups and local schools" about agrichemicals and groundwater.

At least one analysis of educational programs to inform the public about water quality issues indicated that extension personnel can be very effective with the right program emphasis (Mancl, et. al., 1989). In their program in Pennsylvania, Mancl, Sharpe and Makuch found inservice training and a clinic

format to be an effective means of disseminating water quality information to the public through the Extension Service. In Utah, many ES personnel have been conducting training programs in their respective disciplines. These are being continued and refined to address the increasing importance of water quality issues. Additional educational efforts include the interagency workshops mentioned above. Through these, ES and SCS guidelines will be increasingly similar. Users will receive reinforcement of the same information through their interactions with both ES and SCS personnel.

ES personnel are also cooperating with those of the Utah Water Research Laboratory (UWRL). For several years the International Office for Water Education (IOWE) at the UWRL has provided lesson plans and inservice training for public school teachers on the hydrologic cycle. Water education is an integral part of the required Utah State Core Curriculum. Providing lesson materials keyed to curriculum requirements makes it easier for teachers to incorporate water education into such areas as English, math, and social studies, as well as science.

The inservice component has been found to be an effective means of encouraging use of the materials, by: (1) making the teachers aware of and comfortable with the subject matter, (2) demonstrating how easy many of the activities are to do, and, (3) showing that many of the activities dove-tail to fulfill core curriculum requirements in a number of areas. Kits providing harder to acquire supplies (such as graduated cylinders) may also be purchased by individual schools at bulk quantity price from the IOWE. Now, with ES support, they are adding training in water quality. Materials provided at the inservice training include a lesson plan that utilizes the Farm Bureau Self-Help Checklist for groundwater and environmental quality for farmsteads. The UDA has purchased copies of this checklist for distribution to teachers, school children and participants in ES workshops. The IOWE also offers intensive field trip experiences for teachers for graduate credit through Utah State University.

Methods for educating the public and for encouraging private water supply samples 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 inserviced teachers. The comparison will demonstrate which is more efficient in terms of motivating people: (1) to test their private water supply and (2) to complete the self-help checklist.

Additional educational activities include emphasis on water quality in annual ES in-service training. Videotapes on the hydrologic system and water quality have been purchased for use in county offices.

SUMMARY

Achieving state and federal water quality goals in Utah requires changing current water and chemical management practices. There is much to do and relatively little public funding with which to do it. Goal achievement is enhanced by close cooperation between agencies with soil, water and chemical education and management responsibilities. Outlined are the collaborative actions being undertaken. These include a wide range of interagency training, research and action projects. Some are innovative. Others utilize more common approaches. All take a cooperative, coordinated approach to protecting Utah's vital groundwater resources.

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