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**BIG SPRING:
ANATOMY
OF
ENVIRONMENTAL
COOPERATION**

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REAP INTERNATIONAL
The Rural Enterprise Adaptation Program
3181 NE 120th Street
Solon, Iowa 52333

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BIG SPRING: Anatomy of Environmental Cooperation

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FROM SILENT SPRING TO BIG SPRING

In the 1980s, the warnings of Rachel Carson revisited us. The call to arms by Carson led to a series of efforts to quell contamination of both surface and ground water resources. Water pollution was addressed in these instances by source, and sector by sector. Agriculture was also examined for identifiable sources of pollution from agrichemicals, nutrients or soil erosion. But the contamination of groundwater supplies from agrichemicals had been associated with single wells, and was generally traced to careless or accidental mishandling. In the 1980s more attentive monitoring showed ever increasing occurrences of both nitrates and pesticides, which suggested that entire aquifers might be contaminated.

The 1980s would be the decade for evolving a strategy which did for groundwater what had already been done for surface water quality and drinking water supplies. Unlike surface water supplies, the remediation of groundwater is considered to be an almost impossible task. The last great unregulated area of contamination of the environment is nonpoint source agricultural contamination, much of which comes off the country's 2.2 million farms. Historically, education and incentives, along with disincentives associated with government support programs, have been used to push farmers in the direction of less environmentally-damaging practices. That effort has been largely focused on restricting soil erosion. After over half a century of concerted effort, soil erosion continues to be an enormous problem for the farm sector. It was generally conceded that part of the farm policy encouraged damaging practices. Thus it was reasonable to speculate on how effective could be an educational program on groundwater protection, unless basic changes are also made in farm policy. Independent of this evolution of thought by persons within the agricultural community, public attitude became less tolerant of farm subsidies. It was an ideal climate in which to introduce the novel notion that *farmers, like other polluters, should pay.*

At the national level, progress towards a unified groundwater protection policy stalled in debates over which existing laws to amend -- notably either the Clean Water Act or the Safe Drinking Water Act; and whether to tie groundwater protection more directly to general agricultural policy or to the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA); or if entirely new legislation should be created. As one Capitol Hill observer noted, groundwater has no 'father' or 'mother' in the legislative committee process, to steer it through review, amending and agency assignments.

Groundwater also surfaced as an issue precisely when the 'New Federalism' of the Reagan Era called for decentralization of regulations. States were asked to take charge of their groundwater problems, when many did not even understand the nature of that problem. Few states had a history of regulation of groundwater protection to guide them with their enhanced authority.

Iowa shared these obstacles and challenges. Iowa also had more reason to be concerned than most states. Iowa uses 10% of all agrichemicals applied in the United States. A third of its population is directly or indirectly involved with the agricultural sector. Iowa State University is also one of the country's leading agricultural colleges and has a reputation as a center for the development of so-called conventional farming methods. Iowa is also relatively small, with three million residents. These factors suggest that agencies responsible for groundwater protection will have less resources than do many states and meet more resistance by the population.

Yet despite these challenging conditions, Iowa developed a groundwater protection strategy that has become a model for the nation. Part of the eventual success story can be attributed to a special set of circumstances in Iowa -- which includes some of the very challenges listed above. But most importantly, a group of Iowans refused to accept the barriers as immovable. By banding together and showing a unified front, a coherent plan and a willingness to share resources at an interagency level, Iowa went from being a prime victim of conventional agricultural practices to a living practical laboratory for alternative approaches, spread across Iowa's 99 counties.

The basics. Three general conditions were in operation at the end of the 1970s and early 1980s in Iowa which helped establish the right climate for groundwater projects:

Motive. First, thousands of farmers who had followed the 'conventional wisdom' of high input-cash crop farming, coupled with expanding land indebtedness, went out of business during the decade. This made farmers skeptical of what they had been told. It also made many persons within the agricultural establishment reassess their philosophical guidance.

Attitude. Second, even during hard economic times, Iowa farmers showed in survey after survey that they were very concerned that their practices contaminated the environment, including groundwater. Without that widespread support by farmers, the nonregulatory approach, which is the cornerstone for Iowa's groundwater strategy, could never have been effective.

Place. Finally, Iowa utilized a relatively circumscribed geography when modeling its groundwater strategy. The Big Spring Basin Demonstration Project in Northeastern Iowa was a manageable area and a perfect place for monitoring the effects of various farm practices on an aquifer.

Iowa was not alone as a state with farmers ready for change, and who were environmentally sensitive. Even the geological uniqueness of Big Spring might have been replicated on a smaller scale elsewhere. But what Iowa had, which others did not, was a very effective inter-agency working group. The Ad Hoc Karst Committee and its successor the Iowa Consortium on Agriculture and Groundwater Quality, utilized the Big Spring Basin Demonstration Project to craft a statewide program for agriculture. It produced goals and processes that were embodied in the comprehensive groundwater protection strategy which led to the 1987 Iowa Groundwater Protection Act.

That legislation was remarkable both for the amount of money devoted to groundwater protection in a state of limited means; and because it has continued to inspire the development of innovative, proactive efforts aimed at sources of groundwater contamination.

This book is not just a history of Iowa's remarkable accomplishments. What is ultimately important is for readers everywhere to get a better sense of how to do a similar thing in their own area: how to build a coalition, to go beyond personal agendas and to truly mobilize local resources to solve a problem. The problem could involve groundwater quality, or it could be an entirely different matter. In Iowa, for example, the methods of the initial Ad Hoc Karst Committee, which precipitated the whole process, were applied to rural health issues, to alternative energy and protection of rural wild areas, among other things. Models from Iowa have also been used around the country and even on an international level. Consider this as both history and a work book. Adapt, borrow, exploit and use the following to pursue your own dreams and campaigns.

THE NATIONAL SCENE

Between 1975 and 1985 the United States Environmental Protection Agency conducted five nationwide surveys to determine the extent of organic contamination of groundwater systems. The results produced by these surveys were instrumental in alerting states to their particular groundwater problems. In 1975 the National Organics Reconnaissance Survey sampled 16 groundwater systems for carbon tetrachloride and 1,2-dichloroethane. In 1976-1977, the National Organics Monitoring Survey looked at 18 groundwater systems for the presence of 10 volatile organic compounds (VOCs). The National Screening Program for Organics in Drinking Water surveyed 12 systems for 13 VOCs between 1978-1979. Another survey conducted in 1978, the Community Water Supply Survey, looked at 330 small community groundwater systems for 8 VOCs. The Groundwater Supply Survey of 1980-1981 looked at 945 groundwater systems for 29 VOCs. The Rural Water Survey (RWS), conducted in 1978-1979, tested for 40 groundwater contaminants (microbial, physical, chemical and radioactive) in 2,654 rural households across the country. Collectively, these and other EPA and state surveys found 17 different pesticides present in groundwater in at least 23 states.

As early as November 1980, EPA moved to address these problems by issuing a "Proposed Groundwater Protection Strategy," which emphasized a preventive approach to groundwater protection. The goal of the Strategy was to protect and enhance groundwater quality. The Strategy proposed that groundwater be classified according to its use. States were encouraged to develop their own groundwater protection strategies, with EPA playing a limited role.

That initiative was halted in 1981. In June 1982 the EPA Administrator directed the agency to develop a new groundwater protection policy, which was subject to review by the Cabinet Council on Natural Resources and the Environment. In that review, the Secretary of the Interior, who chaired the Council, argued that the policy proposed established too strong a federal control over groundwater. It was rejected.

In June 1983 EPA created a task force to determine how the agency might support states in their groundwater protection plans. The Draft Groundwater Protection Strategy published in January 1984 was the product of that task force. The Strategy proposed to 1) strengthen state groundwater programs; 2) review the need to control unaddressed groundwater problems; 3) create a policy framework for guiding EPA programs; and 4) strengthen EPA's groundwater management organization.

While questions of authority were being worked out in these policy statements, a great deal of effort was devoted to questions of legislation which would address the role of research, information and data collection between United States Department of Agriculture (USDA) and United States Geological Survey (USGS). Should USDA have the lead agency role in addressing nonpoint source groundwater contamination; or should the United States Geological Survey assume this role? Or should it be EPA?

The basic dilemma was that EPA had the authority to protect America's groundwater resources, including protection from agrichemicals; but it did not have the manpower to do the monitoring, nor the financial resources to direct state actions to solve these problems, nor clear statutory or rule authority applicable to groundwater.

This was also the conclusion of the House Environment, Energy and Natural Resources Subcommittee which reviewed the August 1984 EPA National Groundwater Strategy. The Subcommittee felt that EPA's Strategy did not go far enough in providing financial, technical, and other assistance to states for development and implementation of their groundwater protection programs. The subcommittee advised EPA to develop specific regulations and guidelines for groundwater protection which applied to existing EPA regulatory programs, which states could adopt into their own programs.

PROJECTS

The first national program to include assistance for state protection of groundwater had been the 1980 Rural Clean Water Project (RCWP), inaugurated with an appropriation of \$64 million. The program was administered through USDA's Agricultural Stabilization and Conservation Service (ASCS) with technical

assistance from the Soil Conservation Service (SCS), and with consultation from EPA. RCWP eventually funded 21 watershed projects in 22 states. The objectives of the program were to 1) improve water quality and beneficial uses in the most cost-effective manner possible, consistent with the production of food and fiber; 2) to help rural landowners and farmers practice nonpoint source pollution control; and 3) to develop and test programs, policies, and procedures designed to control agricultural nonpoint source contamination.

The RCWP encouraged farmers to use Best Management Practices (BMPs) through a series of cost-sharing incentives. The primary thrust of the program was focused on surface water projects, and did not address complete pollution prevention. Few projects considered groundwater and some BMPs for surface water likely were harmful for groundwater. But it was a positive step and provided a working mechanism which later proved useful. Perhaps as importantly for Iowa's eventual groundwater strategy, the RCWP also encouraged researchers, agronomists, and state agencies to think in terms of problem areas within their state; and to develop strategies for reducing agricultural impacts on groundwater quality through the aforementioned BMPs.

Unfortunately, the program was never fully funded, so it was not able to produce conclusive programs or procedures. The September 1990 assessment of RCWP done by the National Water Quality Evaluation Project at North Carolina State University concluded:

"Though the RCWP projects have had varying degrees of success in combating nonpoint source pollution, overall, The Rural Clean Water Program should be considered a success. As an experimental program designed to test methods for preventing and controlling nonpoint source pollution in rural areas, RCWP has accomplished that charge and recorded and published its findings.

"... Perhaps the most important finding of this program, however, is that farmers themselves are key to the success of each RCWP project. Agencies can evaluate and plan and coordinate forever -- but only a high level of farmer participation will ensure the success of a project. And while cost-sharing is effective, it is not the overriding reason farmers participate in projects.

"Farmers participate because they see a reason to: it may be to avoid regulation (or comply with it), or because other farmers are doing so, or for economic or environmental reasons

"Education, therefore, is the cornerstone of a voluntary program...

"Most important, however, is the one-on-one contact between project personnel and farmers....

"The farmer who helps develop the local program and contributes to planning the project will be its most enthusiastic supporter and participant."

EARLY STATE EFFORTS

Iowa was fortunate to have neighbors who developed groundwater problems about the same time, or even before, those in Iowa. These states were obliged to act on the situation, and Iowa's agencies were assisted by those discoveries in their own early planning. Some portions of these other programs were utilized in Iowa's strategy. Just as valuable was exposure to possible strategies which were rejected as applicable to Iowa.

WISCONSIN

Wisconsin, with its varied agricultural base, developed a contamination problem from aldicarb used on potatoes. The first high reading for that pesticide occurred in 1980 in a single non-potable well. By 1981 and 1982 surveys turned up traces of aldicarb in 18% of samples. In 1982 an emergency aldicarb ruling was

issued that became a permanent rule prior to the 1983 legislative session. This instituted a five-step monitoring process that became known as the 1983 Wisconsin Act 410.

Aldicarb posed a challenge to regulators because it was the pesticide of choice for the state's potato growers. But it was also linked to contamination of Wisconsin's milk supplies. Continued use of aldicarb, even with regulation, had to take into account Wisconsin's complex topography, which included extensive areas of permeable sand and also karst terrain with sinkholes. Finally, this threat occurred in a state where, like Iowa, two-thirds of the population relied on groundwater for drinking water.

Following monitoring, the state was zoned. Handling and use requirements for aldicarb were tailored for particular contamination levels and vulnerability. Some areas totally banned aldicarb. Other zones restricted the amount and method of application. Some areas were unaffected. Union Carbide, manufacturer of aldicarb, took Wisconsin to court, arguing that it did not have the authority to change application methods. The company lost the case and eventually assisted Wisconsin with its program.

In Act 410, Wisconsin created a monitoring process and a two-step enforcement process. The state created an enforcement standard and a "preventive action limit" (PAL). A PAL is set at a concentration of a substance in groundwater equal to 10, 20 or 50% of the enforcement standard (depending on the substance's health-related characteristics). PALs are incorporated into enforcement management practices and can trigger remedial action.

Immediate enforcement is triggered when the enforcement standard is exceeded. At that point, the regulatory agency must prohibit the continuation of the contaminating activity.

Wisconsin began working on its set of standards almost immediately after passage of Act 410. They later tightened their storage requirements for pesticides and fertilizers, requiring that they be stored on impermeable pads. To finance the \$1 million a year monitoring program, Wisconsin used both general tax revenues and a special fund collected from agricultural companies. Companies which produced active pesticide ingredients were charged annual fees up to \$4100, of which \$2000 went into a multiagency groundwater program fund, with the balance used for monitoring and research.

FLORIDA

Florida created a State Legislative Task Force to assess some 42 cases of groundwater contamination which had been identified in August 1982. These were multiple sources of contamination, ranging from surface impoundments to industrial storage tanks, and also pesticides. The Task Force created a single state office to be responsible for groundwater. It also developed a monitoring system and promulgated rules for classifying groundwater by uses. Highest protection was given to "single source aquifers" and potable aquifers. Enforcement was handled through a permit program.

CALIFORNIA

California accumulated several incidents of serious groundwater contamination in the 1970s before a report was requested on the situation by the Assembly Office of Research. That report was published in June 1983. It identified 512 known instances of groundwater contamination by more than 50 pesticides. California adopted a policy which treated groundwater in the same fashion as it did surface water, with a nondegradation policy to maintain existing water quality. The State Water Resources Control Board acted as an "umbrella agency" for all ground or surface water efforts. Four state agencies shared responsibility for groundwater protection: The State Water Resources Control Board, The Department of Water Resources, The Department of Health, and The Department of Food and Agriculture.

Violations of the nondegradation standard were to be handled by the state and regional boards. California reported problems initially in creating their monitoring system of 394 groundwater basins. In 1981, California spent about \$410,000 to monitor 10,000 small community systems permitted through the Department of

Health Service. But California estimated that to monitor the 100 most important groundwater basins alone would cost \$10 million.

NEBRASKA

Nebraska did not produce an early groundwater protection program. Instead, a great effort was expended in this state to reduce the negative impacts of agricultural practices on groundwater, prior to adoption of the Chemigation Act of 1985. In an attempt to understand what should be put into the Chemigation Act, particularly to promulgate Best Available Technologies (BATs) and other means to protect the state's aquifers from the 26,000 center pivot irrigation systems it had, Nebraska embarked on extensive research, including the RCWP Long Pine Project; and the Hall County Demonstration Project that looked at BMPs to reduce nitrate pollution of groundwater. Another \$1 million, 5-year project was funded by Burlington Northern Foundation. That project looked at ways to refine the technology used in chemigation, including check valves, back siphoning preventers, metering systems, injectors, interlocks and other equipment. The project looked at the efficacy of chemigation as an agricultural practice and considered its impact on the local environment.

Unfortunately, the research efforts, in the words of one of the participants, raised more questions than were answered. Eventually, the Chemigation Act was drafted. Roger Gold, then Environmental Coordinator and Head of the Department of Entomology, University of Nebraska-Lincoln, concluded in remarks before the House Committee on Agriculture that even with the five projects alluded to earlier, "in many cases, the research that is needed is well beyond the capabilities of individual states to approach. So Federal resources and Federal assistance are needed."

Nebraska did establish Natural Resource Districts, which were based on watershed boundaries. These had their own authorities to regulate practices and even to raise taxes for revenues.

CONCLUSION

These early state actions were characterized by specific reactions to incidents of groundwater contamination. While there was some use of nondegradation (California), and extensive attempts to develop BMPs and BATs (Nebraska), regulation of permits or restrictions on use were the preferred course of action. State actions were usually linked to violations of the Safe Drinking Water Act standards, acceptable daily intake, or to health advisory levels. Differences in these standards, incompleteness, and a lack of understanding of chronic health effects from drinking minute but persistent contaminants lead state authorities to push for Federal development of effective standards.

It is clear that most of the necessary elements for a successful program were identified in these programs. What was missing was a sustained, coordinated effort with proper identification of roles and authorities, and a systematic plan for achieving project goals. None of these states integrated their response to specific problems into comprehensive pro-active programs, particularly in their early stages. Iowa did.

In subsequent chapters this report will identify the characteristics which made the Iowa Groundwater Protection Strategy, through the Big Spring Basin Demonstration Project, one of the most successful programs in the country. Parenthetically, it should be noted that much of Iowa's success stems from its triumph over obstacles and barriers which hampered the efforts of other states and federal programs.

SECTION I. BEGINNINGS

Time-Line

- August 1976. Publication of *Irrigation in Iowa*, study of water availability and limited water quality information. The study utilized extensive interagency cooperation.
1976. Iowa statewide water quality planning to comply with Section 208 of the Clean Water Act, with Department of Water and Waste Management (DWAWM) as lead, with Department of Soil Conservation (DSC) responsible for nonpoint source planning.
- 1976-1980. Four-Mile Creek Project, Howard Johnson and James Baker, ISU Agricultural Engineering, with EPA Environmental Research Laboratory at Athens, Georgia; an agricultural water quality project dealing with surface water and model development.
- 1978-1979. Iowa Geological Survey (IGS) conducts limited study of nitrates in wells and correlation to well depth and geological factors. 22 county analysis of some 20,000 water analyses from a 6-year period in Northeast Iowa for nitrate concentrations/ aquifer correlations.
- March 1981. USDA-SCS River Basin Planning Public Survey begins in Northeast Iowa River Basin area. Public hearings identify groundwater quality as a major public concern.
- October 1981. Big Spring Basin Research Study begins.
1982. Big Spring Basin Research findings are discussed among cooperating groups, implications are unexpected. Data includes early survey of farming practices, including use of agrichemicals.
- October 1982. ISU-CES issue Best Management Practices report for Section 208 nonpoint source plan.
1983. Iowa Legislature approves start of a state nonpoint source pollution program out of the Department of Soil Conservation.
- June 1983. Tour takes place in the Big Spring Basin area by various state and Federal agencies. The idea to have an interagency group work on problems in Karst region of the state is put forth.
- July 1983. Northeast Iowa Conservancy District is taken on same tour of the Basin, at request of its president, William Gaspar. Decision is made that NEICD and CES will be co-sponsors in new interagency working group.
- October 1983. First formal meeting of what will be called the Ad Hoc Karst Committee meets. Important component of the meeting are reports by IGS on water quality results linking excessive chemicals to groundwater pollution; and presentation of statewide BMPs for Section 208 agricultural NPS contamination.
- December 1983. Letter to Dr. Jerry DeWitt of CES, author of BMP recommendations, from Bernard Hoyer of IGS, laying out areas where soil erosion-oriented controls must be altered to protect groundwater resources.

CHAPTER 1: IOWA BEFORE BIG SPRING

Iowa began to assess the impacts of agriculture on groundwater in the mid-1970s. The presumption was that this was not a problem. And in fact researchers at the Iowa Geological Survey often had to modify studies on water availability to include water quality. In those cases where elevated nitrates did appear back then, it was presumed that this was evidence of single well contamination. But the notion that entire aquifers could be at risk from nitrate, or that pesticides might be finding their way into groundwater supplies through the soil profile, was not seriously considered -- even by water researchers.

In the 1970s, Iowa's concern centered on protection of surface water supplies from eroding soil; and nutrients or chemicals in runoff. State planners were more concerned over the availability of water, particularly in light of increasing irrigation in Western Iowa.

As with other states, Iowa at that time was obliged to establish some interagency cooperation to satisfy state and federal mandates on water issues. In 1973 the Iowa Department of Soil Conservation (DSC) began a systematic study of the six major river basins in Iowa. At the heart of this process were public hearings in which local concerns of residents were recorded. Conservancy boards were established to coordinate these efforts and to find solutions for local residents. DSC was the state-level liaison between those boards and other state resources.

In 1975 the Iowa Department of Environmental Quality (later called the Department of Water, Air and Waste Management or DWAWM, and then the Iowa Department of Natural Resources or IDNR), was designated to handle Iowa's water quality planning under Section 208 of the Clean Water Act. The governor designated DSC as the agency responsible for nonpoint source planning. Iowa State University Cooperative Extension Service was called in under Section 208 to help develop plans to prevent soil and agrichemicals from reaching surface water supplies.

Also at this time in response to drought, Iowa embarked on a State Water Plan. This dealt primarily with water availability and water allocation priorities, in part prompted by drought conditions. Later, after public hearings showed strong public concerns with water quality issues, the Iowa legislature made surface water and groundwater quality issues part of that plan, and called for a state strategy to protect water quality.

But the first efforts in the spring of 1976 were aimed at assessing water supplies. As part of that sampling of water supplies, IGS included some water analysis. It was reasoned that if Iowa were to follow the path taken by Nebraska towards heavy use of irrigation, then potential problems should be identified, including groundwater contamination from nitrate and other agrichemicals. The resulting Iowa Geological Survey report, *Irrigation In Iowa*, discussed likely water-quality problems, particularly from nitrate, that might arise. Also, at that same time, IGS sampled 50 Northeast Iowa wells for nitrate contamination. This was done because of growing citizen concern over declining water quality. In particular, dairy farmers were losing their Grade A license because of excessive nitrates in their water. Well drillers were also reporting that they had increasing difficulty in finding uncontaminated water, particularly in the widely used, shallow bedrock aquifers. According to George Hallberg of IGS, this work failed to precipitate a reaction in either the governor or General Assembly because drought conditions and handling of the "energy crisis" from the Arab oil embargo dominated public policy debates.

In 1978-1979 DWAWM, with EPA support, funded a review of 20,000 analyses of well water samples from a 22-county area. Patterns of higher concentrations of nitrate were associated in the study with shallow depth to aquifer. Some elevated concentrations of nitrate were linked to karst topography and its sinkholes. But other concentrations were associated with flat land without sinkholes, where the aquifers happened to be close to the surface. The '78-'79 review was published in 1981 and 1982, and did gain attention that would lead directly to the work done at Big Spring.

Also at this time another Iowa project had begun, designed to gauge the impact of agricultural practices on surface water. This was the 4-Mile Creek Project, whose principal investigators were ISU Agricultural Engineering professors Howard Johnson and James Baker. Their objective was to document the impacts of different BMPs on surface water supplies. According to Dr. Baker, thousands of dollars and countless hours of ISU resources went into the setting up of 4-Mile Creek, in collaboration with EPA's Environmental Research Laboratory in Athens Georgia. In 1980 funding ended for the project. Still, enough time had gone by that there was a body of data, equipment and methodologies which could be used in setting up extensive watershed monitoring elsewhere. Included in the 4-Mile data were analyses of tile lines showing elevated nitrate levels from conventional fertilizer applications and the presence of atrazine under some conditions.

In March 1981 the Northeast Iowa River Basin Study began. It was the fourth such watershed study, and accordingly, it drew many state resources to it, to meet mandated deadlines. DSC requested that USDA's SCS provide federal guidance on the project. There was some presumption on the part of state officials, not only at DSC, but also DWAWM, that primary public concern would be on contamination of surface water from soil erosion and runoff. But at public hearings before the newly created Northeast Iowa Conservancy District board, the most voiced issue was protection of groundwater supplies.

BIG SPRING

IGS had operated in a 22-county area that encompassed the Northeast Iowa River Basin Study. Within that territory they had special associations with the Big Spring Basin. This 103-square mile watershed drains to the state's largest artesian spring, Big Spring. Here, the water quality data dated back to 1961, when the Iowa Conservation Commission had purchased the private trout farm which used the outflow of the artesian spring. ICC conducted regular checks of nitrate levels in the outflow. The monumental task of charting every sinkhole associated with Big Spring was conducted by ICC, IGS, and Soil Conservation Service. ICC staff did the sinkhole mapping and conducted dye tracings for IGS to determine the size and characteristics of the aquifer that fed Big Spring. Often they were assisted by the farmers under whose land the aquifer passes.

Hallberg and Hoyer discussed with SCS and DWAWM the logistics of an extensive field study to be done at Big Spring which would help isolate the relative contributions of agrichemical runoff from sinkholes, or from infiltration and regular recharging of the aquifer. Though some of the hydrology of the watershed had yet to be learned, it was clear that the area was nearly all agricultural -- with about 50-60% of the land planted to corn, 30% in forage cover crops, and another 5% forested. There were no significant municipalities in the Basin, with about 3,500 persons living in four communities. At the time that they proposed the study, IGS was hoping that they could gage the groundwater discharge from the spring accurately, which would then afford a more detailed study and allow for mass balance calculations. (This proved to be the case, and the hydrology of Big Spring was even more optimal for their field study than they had hoped, with 90% of the groundwater which falls on the watershed emerging from Big Spring, and almost no supplemental supplies of water originating outside the Basin.)

Past monitoring of the Spring for nitrates showed strong correlations between use of that agrichemical and its presence in groundwater. Chemical usage figures were compared to well samples to establish consistent correlations. IGS had data going back to the 1960s. Since the late 1960s there had been an increase in nitrogen fertilizer of 2.5 times, and a corresponding tripling of nitrate concentrations at Big Spring.

A START

A \$20,000 grant from SCS and EPA, delivered through DSC and DWAWM, was provided for IGS. That fund subsequently grew to \$45,000. By November 1981, IGS began continuous monitoring of Big Spring and other portions of the hydrological system. Mapping of the geology and hydrology of the Basin was also completed, and land use surveys were made by IGS staffers and others in 1981 and 1982-1983. Later, USGS gaging equipment was installed to help measure the groundwater flow at the Spring and for surface water flows in the area. Nested monitoring wells were put into place, mostly to tap water tables. Equipment would

be upgraded as funds permitted, but in the initial period the researchers relied on whatever they could get, including borrowed hardware, such as Jim Baker's special water flumes from the 4-Mile Creek Project. Iowa State University ag-engineers also built sampling stations along tile drainage lines. Nearly every farm well was inventoried in the watershed for water depths and sampled for water quality, with 30 cooperating farms selected for weekly monitoring.

The first water year data made it clear, by matching the hydrological characteristics of the area and rain events, that infiltration, and not run-in, was the major mechanism for supplying the majority of nitrate that emerged at Big Spring. The highest concentrations of suspended sediment were found immediately following a rain event. Pesticides and bacteria moved then in a 'slug' through the aquifer, creating brief but acute problems in local shallow wells and at the state trout hatchery at Big Spring. In fact, they identified three temporary peaks which came after major rain events.

The investigators found that nitrate concentrations almost always peaked out-of-phase with pesticide concentrations and never at peak runoff times. Then during slow infiltration recharge of the aquifer, nitrate levels rose dramatically. From various analysis techniques they deduced that over the course of a water year, 95% of the mass of nitrate to enter the groundwater of this aquifer came via infiltration.

The levels of nitrate that showed up in the groundwater were elevated enough to constitute a health concern, particularly since the chronic effects of drinking small amounts of agrichemicals was not fully understood. For the first two water years there was an average of 602 tons of nitrate-nitrogen discharged with the groundwater, equivalent to 30% of the applied N fertilizer. For both groundwater and measured surface water flows there was an average of over 1,100 tons -- the equivalent of 50% of applied nitrogen.

RESULTS

The first water year, pesticides were detected intermittently and in varied concentrations at Big Spring. Collectively, 20 pounds of active ingredient atrazine were detected. The majority of atrazine concentrations throughout the year were under one part per billion (PPB), and most elevated concentrations were associated with increased flow rates from runoff and heavy sedimentation related to a rain event. Also there was a correlation between applications and higher concentrations in April, May and June. This was a shocking revelation. They had not anticipated finding pesticides so commonly in groundwater, even in this vulnerable environment.

But there were also peaks in late February and early March which were attributed to increased recharge from snow melt. So while there were out-of-phase anomalies, and detectable amounts of pesticide showing up in the groundwater at the conclusion of that first water year, it was not the major point of interest to IGS researchers or others who reviewed their work. What did register with researchers was the strong correlation between nitrogen loss and yields. Clearly there were dangers associated with over application of nitrogen and resulting groundwater contamination. What they had was one of the best opportunities to conduct a major field analysis of cropping practice/water quality response experimentation ever done on a real world scale.

"We sat (in the IGS conference room) and laid out what we thought we could do in the Big Spring Basin," Hallberg said. "The plan of attack we could take, the controls, the measurements of discharge of groundwater and relating that to how much mass is lost."

CONFIRMATION

Adding to the impact of the data at Big Spring were control studies conducted in Floyd and Mitchell Counties, where the land is somewhat flatter and the karst terrain more localized and less pronounced. Here the aquifer is in a three-part system, with layers separated by relatively low permeability shale. Bob Libra of IGS wrote in his report that they knew from their selection of these counties that they would not be able to monitor groundwater contamination with the same kind of accuracy or scope enjoyed at Big Spring. But that was not critical to their findings.

The Floyd-Mitchell objectives were to: 1) gather detailed data on the hydrogeology and groundwater quality of this particular area; 2) assess the groundwater quality in different hydrogeologic settings; and 3) further study how surficial contaminants are delivered into the carbonate aquifers.

To do this, they selected 50 wells representing the four principle geologic regions of the counties. In this group, 20 wells were monitored monthly, as were three surface water sites and two drainage tiles. The water was tested for nitrate, bacteria and pesticides. The data showed that not only were agrichemicals moving to groundwater at previously unexpected rates; but that with proper monitoring the results became so predictable that researchers could relate potential for agrichemical contamination to geological settings. The results demonstrated that geological settings acted as predictors of agricultural contamination potential, and they also confirmed that infiltration of both nitrate and pesticides presented a regional threat to groundwater. The highest levels of detected herbicides coincided with shallow wells where there was little soil covering (5 to 15 feet) above the aquifer and intensive row crop farming. The least contamination showed up in deep bedrock areas where the carbonate aquifer is covered by at least 50 feet of surficial material.

In the spring of 1983 IGS requested a meeting with colleagues at Iowa State University Cooperative Extension. They wanted to show the results from their groundwater studies, and to offer their interpretation of the data so that when they began making these facts public, CES would be forewarned. They had expected a small meeting. But when they got there, virtually all of the department heads in the agricultural college were present. Nervously, they went through their methodology for analyzing, cropping practices and inventory of chemical use, and the amounts of agrichemicals lost to ground and surface water. They explained how they had ruled out runin, noting that there was supporting scientific evidence to support their claims. Some of it was in fact being generated at ISU, and at neighboring state agricultural experiment stations, which suggested that nitrate did move downward through soil more rapidly than was previously believed under varying conditions.

No one at that meeting refuted their data. Dr. Alfred Blackmer even told Hallberg after the presentation that his own work suggested that 50% of the nitrogen applied to corn ground escaped through leaching. Blackmer was conducting some of the country's most sophisticated analyses of the nitrogen cycle, utilizing the isotopically "labeled" nitrogen and precise soil models to study macropore flow. He also was finding support for concepts proposed by Hallberg and others which suggested accelerated flow of agrichemicals through fissures, cracks, worm holes or other downward paths; rather than the accepted model of chemicals adhering to soil particles or moving as 'slugs' of contaminant in solution with the surrounding soil and groundwater.

FIELD DAYS

In the summer of 1983 field tours were put together to show the components of the Big Spring project. By June there had been at least one major bus tour of state and federal officials who came through to hear the results of the study and to see the area in question. In one June group was William Gasper, president of the Northeast Iowa Conservancy District (NEICD). In the course of showing the participants various sites around the Basin, Hoyer and Hallberg explained the implications of BMPs on groundwater quality. Gasper was in a position to consider this highly useful, since Big Spring was within the territory of his own NEICD study. He knew from the public NEICD hearings that farmers felt that most BMP recommendations did not match Northeast Iowa styles of farming. Perhaps he could find answers among this group.

Gasper made a proposition for Dan Lindquist of the State Department of Soil Conservation, who was executive secretary of NEICD, and Hoyer. NEICD needed answers for their farmers, and to help assemble their Northeast Iowa River Basin Study, which was already running behind the schedule mandated by the governor's office. Might it be possible to utilize various state resources already working in the Basin, to benefit local farmers at the same time that this important research took place?

Gasper then approached his NEICD board and they expressed interest. A tour was quickly arranged for board members and their wives, lead by Hoyer. The pitch was made. The board was sold, and it was decided that the Northeast Iowa Conservancy District and Cooperative Extension Service would be co-sponsors of an ad hoc working group, to establish a suitable multi-agency, multi-level research and demonstration project in

the Big Spring Basin. Dan Lindquist, as executive secretary, extended invitations to a dozen state and federal entities to become formal members of this working group. A date in October 1983 was chosen for the initial meeting. *The stage was indeed set.*

CHAPTER 2: NOT YOUR AVERAGE COMMITTEE

Time-Line

- October 1981. Big Spring Basin Research Study begins.
- Spring 1983. Project results are discussed with ISU agricultural staff.
- Spring 1983. Various participants begin speaking at public and technical meetings, and to groups of farmers, extension agents and interested agencies.
- June 1983. Tour of Big Spring Basin, which includes president of Northeast Iowa Conservancy District, William Gasper, Dan Lindquist of Soil Conservation Service, Hoyer and Hallberg of IGS. Decision made to see if an inter-agency group can help NEICD and 22-county area with groundwater contamination problems.
- July 1983. Tour of Basin by NEICD board with Hoyer presenting. Organization agrees to be sponsor, with ISU CES, of inter-agency task force.
- October 1983. First meeting of groups which were invited to participate in what would be called the Ad Hoc Karst Committee.
- December 1983. Meetings of full multi-agency group; also Public Participation Task Force.
- January-February 1984. Smaller meetings, assignment of tasks and report areas to various participants.
- 1984. 6-part TV news series by KWVL (NBC, Waterloo) on water quality and groundwater problems.
- March 1984. First meeting by Problem Task Force to compare and decide on problems.
- April 1984. Meeting of Karst Area Problems Task Force.
- April 1984. General meeting of Committee on agency roles.
- May 1984. General meeting to hear reports of subcommittees, identify further directions.
- June 1984. Survey of Basin farmers by Steven Padgitt of Iowa State University and Clayton County Extension agent Jim Hosch. Looks at attitudes, practices, uses of agricchemicals, size of operations.
- July 1984. Meeting of Implementation Task Force to define scope of Big Spring Demonstration Project (BSBDP).
- August 1984. Research Task Force meets, identifies four main research areas.
- August 1984. Full Committee receives first draft of project overview, Hoyer is coordinator.
- September 1984. Research Task Force report; Implementation Task Force report on sub-basin project; full Committee meeting for reports.
- October 1984. Karst Committee hosts seminar in Decorah, Iowa at Luther College, wide attendance by Iowans, key federal agencies and vested interests such as the National Agricultural Chemical Association are invited to attend, do lectures, review. Good TV and print media coverage.

December 1984. Technical Assistance Task Force gives cost estimates report to Committee.

January 1985. Full meeting of Committee, funding needs of participating agencies are reviewed.

March 1985. Full Committee receives final Ad Hoc Report, by Hoyer, including grant proposals written by Hallberg and Dr. Linda Wilson of ISU.

THE AD HOC KARST COMMITTEE

Cooperation between agencies is not a new concept. It was certainly not a new notion for the Iowans on the Karst Committee, and in fact the participants had several examples of cross-fertilization which had already taken place, including the statewide soil survey, the water supply assessment and the development of BMPs for conservancy districts which were completed prior to the Northeast Iowa Conservancy District Program.

What was new about the Karst Committee and its successor the Consortium is: 1) the ambitious nature of the goals which were being pursued through cooperation; 2) the flexibility of the project in accommodating almost every personal need or goal which participants brought to the process; 3) a relatively novel problem/solution situation in the sense that no single agency was ahead of the others prior to coming together - at least in terms of existing programs; 4) a situation which demanded levels of expertise and insights that could only be achieved via the collaborative process; and 5) an obvious, tangible opportunity to have a significant impact on a major state problem, while influencing national environmental policy making as well.

COMMITTEE COMPOSITION

A Baker's Dozen of state and federal agencies made up the initial Ad Hoc Karst Committee which convened in October 1983. They collectively reflected a comprehensive approach to groundwater quality, from monitoring to health assessment, to education, technical assistance and regulation.

Present at the meeting were Iowa State University Cooperative Extension Service; ISU Agricultural Experiment Station; Northeast Iowa Conservancy District Board (which later became the NE Iowa Water Resources District); Iowa Department of Soil Conservation; Iowa Department of Agriculture; Iowa Geological Survey; Iowa Department of Water, Air and Waste Management; USDA Soil Conservation Service; University of Iowa Hygienic Laboratory; University of Iowa Department of Preventive Medicine and Institute of Agricultural Medicine; Soil Conservation Society of America; and the Iowa Fertilizer and Chemical Association.

THE LIFE CYCLE OF A COMMITTEE

It is significant that the Committee/Consortium shifted its ultimate objective and duties to keep utilizing the collaborative powers of the group. Through March 1985 their primary objective was to identify needs in Northeast Iowa for application to what became known as the Big Spring Basin Demonstration Project; and to fully describe that project in narrative form for future planning and funding.

The second general phase, which overlapped the first, vastly broadened the activities and chores of the participants. They perfected aspects of the BSBPD as it moved ahead. Individuals worked on grants for discrete parts of the project -- even seeking funds at times for collaborating agencies in order to move the process ahead. The group also developed a policy scheme that would embrace the entire state -- both for farm demonstration projects and more broadly as a state groundwater protection strategy. That task did not

immediately present itself. But events and needs of participants required that the project become more audacious and accommodating if it was to succeed in being funded.

THE PROCESS

As co-sponsors, NEICD's Gasper and CES's Vivan Jennings shared the chair duties. Dan Lindquist was secretary of the Northeast Iowa Conservancy District and handled the flow of official correspondence between members. It would be an important position, because of the volume of reports and subsequently than the full inter-agency committee. That gave the proceedings a genuine feel of expansiveness, but also control under the rule of reaching consensus before progressing. Hoyer was particularly busy working between the meetings behind the scenes to see how individual reports were coming, and to move persons towards consensus.

For Hallberg, perhaps the first large task of the entire Committee was to get groups to sort out their respective areas of responsibility and authority. Some organizations had been working on groundwater problems, or had it in their charters to do this work. But there was not a strong sense of the points of authority of the respective agencies.

"We put the turf on the table," Hallberg explains. "Groundwater contamination was a new gray area, and we tried to avoid finger pointing. And there wasn't any clear cut programmatic definitions in place. Ours was a consensus process: here is the turf – our different institutions' responsibilities; this is what we want to do, you know how to do it best, you ought to be in charge of that component. The point we were trying to get across is that there is absolutely no point or possibility for success, if we get the money and it is hoarded by one agency. The most positive sign that we were on the right track is when members of the group actually got money from their own agencies to give to other members, because they knew those agencies needed it.

"That became a rallying point. We all had to work together to find the resources. So the issue was not to fight over turf. But to figure out the turf – put it on the table, to figure out how agencies really did relate to the issue."

At that first meeting in late 1983, a variety of reports were presented, including summaries of epidemiological studies of farmers with inferential linkages to agrichemical use; and the rising levels of contaminants in the state's aquifers. One of the presenters was Jerald DeWitt of ISU's CES, who would succeed Vivan Jennings as co-chair of the Committee when Jennings moved to USDA headquarters. DeWitt reported on Iowa's BMPs to meet Section 208 requirements. Reacting to DeWitt, Bernie Hoyer noted that the orientation of the BMPs was to prevent soil erosion. But some strategies, Hoyer said, such as surface runoff diversion, actually contributed to groundwater contamination by diverting contaminants to subsoil water supplies. Hoyer had approached the issue as a hydrologist trained as a soil scientist, who understood agricultural practices, and the potential cross fertilization to come from his fresh perspective had been immediately apparent to everyone.

Following the meeting, Hoyer drafted a letter to DeWitt which elaborated his views on the confounding factors at work with the Best Management Practices aimed at soil erosion control, productive capacity and groundwater protection. The letter in part reads:

"The incorporation of herbicides and fertilizers in combination with conservation tillage practices leads to an interesting dilemma. The research cited indicates significant reduction in erosion and in surface losses of agricultural chemicals. However, do these increase the infiltration losses? We certainly don't know, but it may warrant some research and perhaps should temper our endorsement a bit. We know significant herbicide loss occurs with sediment, but more in total is often lost in solution. Would this produce more pesticide in infiltration waters? Would incorporation increase the persistence of pesticides? Would injection increase the leaching losses of nitrogen?"

"As part of your basic definition of BMPs you have included certain economic phrases: "while still maintaining optimum yields and maximum profit." Perhaps, the "adverse water pollution effects" should reflect the economics a bit more, too. The "effects" include "costs," and the "costs" in health, and alternate water sources or cleanup may affect the rural population disproportionately. Even if these costs cannot be directly accounted for by the "profits" concept of the BMPs, these costs are real and should perhaps be mentioned, at least."

DIVIDING THE TURF

The kind of cross-fertilization suggested in Hoyer's letter became institutionalized in the Committee. One of the things to come from the first meeting was the decision to create a forum where agencies could keep one another informed as they learned more about agriculture and groundwater contamination. Since the Northeast Iowa Conservancy District had responsibility to coordinate water management efforts within its territory, it was chosen for the vehicle to coordinate the forum while state agencies worked on the project.

The Soil Conservation Service had the primary responsibility for offering technical assistance to the Northeast Iowa River Basin Study and to landowners to put into place soil erosion controls under that plan. DWAWM was also monitoring the public water supplies and waste treatment in the area, and had some jurisdiction

SIDEBAR: THE CARE AND FEEDING OF A COMMITTEE

Vivan Jennings. "You have to get consensus among the actors. I think that is why Dan Lindquist had Bill Gasper and me match up. Dan recognized that with another chair there would have been three or four different squabbles and we'd have all walked out. I remember that some of the meetings were very heated. You had a lot of significant people there. So it was important to find consensus and move ahead. That became the outcome of the meetings: we don't walk away from here until we have something in place.

"I give a lot of credit to Dan Lindquist for saying that we ought to focus on one particular issue in Northeast Iowa in Big Spring. But it also evolved, so that people were talking specifically about working with Big Spring, but there was also some real visioning occurring. And I suspect George [Hallberg] was instrumental in that. He was looking at whether Big Spring could be used as an example, as a pilot, with other applications across Iowa and other states.

"There is an organizational development process that occurs in something like this. You need someone with vision -- and that was George Hallberg, largely. You need someone with a good mission, and that would be Dan Lindquist, Bill Gasper and myself -- we worked together in relation to devising what we were going to do. Then you need to empower people, and start laying out assignments, which produces some natural missions. It becomes fun for a Fred Blackmer to actually have N-15 coming out of the Spring -- there was a uniqueness to that situation happening."

Bernie Hoyer. "I wouldn't underestimate the importance of Roger Koster to this whole thing. He lives there [in the Big Spring area]. He had the kind of background to make sure that the soils people would remember that this was about water quality and not just soil conservation.

"Groups have to have a life of their own. The committee system is the stupidest thing in the world, but actually working with people, talking with them, and working these things out, isn't stupid. Because it is the only way. You either shoot them, and find out what happens from that -- or you sit down and actually figure out a way to communicate.

"Some of the groups were very sensitive to some of the issues: how they saw it, and what did we need to do. But that doesn't come out at the official meetings. So the real work gets done from lots of conversations which take place later. I spent literally a

over the construction and location of wells, animal feeding operations and hazardous waste disposal.

Areas. In mapping out the statewide turf for groundwater protection, participants identified the following areas of responsibility and authority:

The University of Iowa Institute of Agricultural Medicine and Occupational Health administered the Iowa Pesticide Hazard Assessment Project, which was part of a nationwide collaborative program with EPA.

ASCS administered national farm programs through the county committee system, including conservation programs, produce adjustment programs, price support programs, commodity facilities loans, state emergency programs and others.

Iowa Department of Water, Air, and Waste Management managed Iowa's water resources. The department evaluated surface and groundwater quality and developed programs to protect and improve the quality of water. Field offices around the state provided consultation and assistance to Iowans whose water is contaminated by pollutants.

Iowa Department of Soil Conservation had the state's leadership role in the areas of soil, water, and reclamation management. The department's mission included state-level setting of priorities, formulating and implementing programs, and establishing policies for preserving and protecting these natural resources in Iowa.

year's worth of my time, usually meeting after the meeting for a day or two, going back and forth to talk to these people, then coming back to Iowa City to try and write the report."

Rick Kelley (IDNR). "I am sure that the direction which the Ad Hoc Karst Committee took would have been very different if the personalities of the individuals [involved] had been different. But it was a congenial atmosphere so that even when you disagreed with someone, people took the time to try and understand their viewpoint, to work towards a consensus. There was enormous respect for the other people who were on the committee. If that hadn't existed, if it had been really adversarial, then I suspect that the strategy would look very different -- very much like a lot of strategies you have out there.

"But it was hard to be defensive very long when working with the Ad Hoc Committee. You found yourself being open and frank and realizing things that you didn't think were true were true. For me, more than anything else, it was a learning experience. The Committee represented some of the brightest minds in the state, really. And they were full of ideas. This was a real adventure for a lot of those people. I would sit back and listen to them. Later on I used a lot of those ideas.[in the Iowa Groundwater Protection Strategy]"

Vivan Jennings. "The key thing was addressing this as an issue. An issue is different from a problem, though a problem can be part of an issue. An issue has economic, environmental facets. An issue is something that makes the public agenda and has a life, like a bell curve, irrespective of what we want to do about it. If it is a crucial issue, you begin to apply strategies to solve it, or it grows to monumental proportions.

"We were very fortunate to be at the beginning of the issue with groundwater quality in Iowa. That meant we were working on strategies to solve it before the issue had grown in the public eyes to where they were demanding immediate solutions. If we had begun the Committee at the peak of the groundwater issue, it would have been easier to get into it, but the accomplishments would have been less."

Rick Kelley. "You won't find many people who have nice things to say about planning. Most people view it as a really silly exercise. But in fact my advice is to spend a lot of time in planning. It makes all the difference in the world. If you look at the plans of Iowa, Wisconsin or Minnesota, or even California, the one thing all their approaches have in common is that they spent a lot of time planning, working out the ideas and

The Iowa Fertilizer and Chemical Association promoted the general welfare and ethics of the fertilizer and chemical industry, promoting the proper application and use of fertilizer and chemicals, and cooperated with the land grant university and other groups to assure proper use of those chemicals.

approaches they were going to take. They allowed themselves to be variably minded about things: it is being new and creative and not being afraid of change."

Dan Lindquist. "I tried to put the anchor out a few times to slow things down [in the Committee]. I wondered if the group realized exactly what they were ready to do. But the group kept pushing it."

SCS, as mentioned previously, helps land owners and operators to develop soil conservation practices for their lands. SCS had program responsibility for the Northeast Iowa River Basins Cooperative Study.

EPA Region VII Office was committed to developing strategies to protect the groundwater and surface water resources in Northeast Iowa.

DIVIDING THE WORK

But official descriptions were only a point of departure in the process of planning a comprehensive plan for Big Spring. There still needed to be the working out of real problems to address, and State resources which could satisfy those needs. These problems straddled many turf areas, making it absolutely essential to stake out working areas. But to insure that the working areas were the right ones, the participants took the time to formulate their long-term working groups and goals. The procedure they went through focused on six immediate tasks:

- 1) define specific problems [in the Karst area]; 2) identify potential solutions; 3) compile pertinent agency activities; 4) determine agency needs; 5) identify research needs; and 6) present recommendations for action to the Ad Hoc Karst Committee.

Out of this effort came five large problems which not only could be addressed at Big Spring by the resources of the Committee; but also were central to general agrichemical problems relative to groundwater throughout Iowa. In subcommittee, five problem areas were identified, which gave a foundation on which individual projects were shaped:

1. Infiltration of nitrogen causes groundwater contamination.
2. Infiltration of herbicides causes groundwater contamination.
3. Runoff carries sediment, herbicides, insecticides, various forms of nitrogen and other material into sinkholes causing degradation of groundwater.
4. Pathogens and other leachate entering groundwater can cause health problems.
5. Dumping into sinkholes and quarries may result in degradation of groundwater.

With this rubric, the subcommittee could create the phased, nonregulatory model that became the Big Spring Basin Demonstration Project (BSBDP). The general objectives and procedures for meeting the objectives of BSBDP are reproduced below, in their five-tier format.

BSBDP OBJECTIVES AND PROCEDURES

<p>>> Education & Technical Assistance Primary Role: ISU Cooperative Extension Service</p>	
OBJECTIVES	PROCEDURES
1. Increase Iowans understanding about the condition of groundwater supplies and the causes of nonpoint-source contamination.	Educational meetings Educational media News releases
2. Begin identifying ways to reduce chemical, nutrient, and sediment contamination while encouraging efficiency (best management practices).	Demonstration plots Workshops; Field days Nutrient & Pesticide Management Assistance In-Service training for field personnel
<p>>> Development of Technical Models Primary Role: ISU Departments of Agronomy and Agricultural Engineering</p>	
3. Evaluate management practices that minimize the losses of fertilizer-nitrogen.	Field and plot studies within sub-basin using nitrification inhibitors, use of credits for nitrogen applied in animal manure, utilization of rotation effects and tillage effects.
4. Evaluate methods to improve recommendation for nitrogen fertilizers.	Soil or other test procedures that measure the nitrogen content and availability in soils.
<p>>> Water Monitoring & Chemical Analyses Primary role: Iowa Geological Survey; University Hygienic Laboratory</p>	
5. Refine understanding of the relationship between the hydrogeology and surface activities.	Expand and refine computerized data base for real time updates of land treatment and chemical management.
6. Evaluate the effects of BMP implementation on water quality.	Quantitatively monitor ground & surface water discharge & quality from pilot area.
7. Understand potential health related issues.	Perform detailed analyses of particular groundwater to look for the occurrence of metabolites(breakdown products) from various pesticides.
<p>>> Implementation Primary Role: Iowa Department of Soil Conservation; USDA-SCS</p>	
8. Encourage farmers to adopt best management practices.	Offer financial incentives in the form of cost share funds for implementing soil conservation measures and certain other BMPs.

	Use a long term contract (or other agreement) to implement BMPs on each farm (including specific nutrient and pesticide management practices.)
>> <i>Evaluation</i> Primary Role: ISU Cooperative Extension Service	
9. Determine the effectiveness of non-regulatory strategies in influencing changes in farmer attitudes.	Pre- and post-project control group design of attitude surveys within pilot area.
	Publicize results of projects with participants, publics, and legislators.

CREATING A DIRECTION

At the May 23, 1984 meeting of the entire Committee, the objectives and procedures were reviewed and standing subcommittees were created for education, implementation and research. Education and research task forces addressed the problems of the total karst area. The implementation task force initially concentrated on developing a strategy for the Basin only. Later it would look at statewide demonstration efforts.

Hoyer told the Committee that BSB DP had three possible ways to develop: 1) as a research project to study the effectiveness of nitrogen management practices and their relation to water quality; 2) an entirely practice-oriented approach that concentrates on BMPs; or 3) a mix of research and application.

Dan Lindquist noted that the intent of the project was *"to develop and implement a complete program in the Big Spring Basin that would include most, or at least many, of the potential solutions that are contained in the Task Force report."* This established the group's commitment to be broad, but locally effective.

IGS shared at this meeting a project outline which had been evolving from committee discussions and their two years of initial research in the Basin. It called for a 7-year effort. This plan of attack became the rubric by which subcommittees could order their work, as they developed priorities, projects and eventually funding needs. All of their efforts were channeled into a single draft of the project.

The subcommittees were fertile ground for collaboration, as revealed in the following excerpt, taken from the first meeting of the Implementation Task Force, August 22nd, 1984. [as recorded in the minutes by Bernie Hoyer]:

"Funding for the project was then discussed. The SCS reported that it probably would limit funding to land treatment demonstrations and, possibly education, but not groundwater monitoring. They also reported that several incentives for sub-basin implementation were controversial and needed further internal evaluation. Kelley reported that EPA would want to support the groundwater monitoring and, possibly, education, but not land treatment. One proposal was believed best, however, because both the SCS and EPA would want to evaluate the whole package for its completeness and integration.

"The roles of various groups in the BSB DP was discussed. The Ad Hoc Karst Committee would function to ensure coordination of the various groups. Each agency in the project would receive funds directly and would be responsible to the funding source only. Both DWAWM

and SCS felt the coordination role of the Ad Hoc Karst Committee was important. Extension would have primary responsibility for the education, i.e., the basin-wide implementation. IGS would have primary responsibility for monitoring water and land use with details to be worked out locally with SCS and Extension. The primary responsibility for the sub-basin implementation would fall on the SCS. They plan long term agreements with landowners either directly or through the SCD. ISU researchers would have primary responsibility for demonstration/research plots.

...

"A few nuts and bolts issues were raised. How can the whole 11 square mile area of sinkholes be included? (Answer: include in sub-basin implementation or in additional needs sections). The budget needs a brief introduction and explanation. (Will do.) Can other "in-kind" costs be reflected in the budget? (Answer: Yes, through the brief budget discussion.)"

After the Implementation Task Force drafted its preliminary approach to sub and entire-basin projects, the Research Task Force itemized these provisions into four groups for proper analysis: 1) nitrogen management, 2) pesticide management, 3) public health issues, and 4) underground water quality.

The synergy of participants was made more complex by the presence of local representatives on the Committee and subcommittees. Four members of the NEICD board were present on the Committee, including two farmers. Gasper was both a local representative and a former SCS agent. Roger Koster and Jim Hosch were from county-level SCS and CES respectively. Hosch continually addressed the issue of how to apply the project proposals to his clients. He was the person whose office would be most affected by whatever plans came from these sessions. Koster was also heavily involved. His work in the Basin area convinced him that statewide BMPs and standard soil erosion approaches were not the best answers for the terrain and style of farming done in the Basin. Koster made it clear, behind the scenes and in meetings, that he wanted practical solutions which could be passed directly to the farmers in his area. Eventually, Koster moved from SCS to become the special coordinator with CES for BSB DP, working alongside Jim Hosch.

SURVEYING THE FIELD

Cross-fertilization was important for the development of the Committee. On sub-committees you frequently saw new perspectives brought to problem areas. For example, Morris Preston, of DWAWM, who managed the state's regulatory program on water quality, was chairman of the educational task force. Also on each subcommittee was at least one member of the Northeast Iowa Conservancy District. The Research Task Force included persons who were directly involved in water quality research and related human health studies; and Extension agents who approached the subject from the point of view of the farmer being researched.

According to Hallberg, it was important to set aside old disagreements and turf from deliberations during the early history of the group. The talent of the participants was such, their commitment sufficiently strong, and the ultimate goal too important to have it otherwise. Among the areas where major disputes could have been predicted among the participants were the following:

- Soil erosion. Should cost share funds go primarily to soil erosion controls, and could BMPs be redesigned to reflect the need to protect both soil and water resources?
- Sufficient and appropriate research. Here the question was whether to encourage changes in farming practices or begin deliberately influencing those practices before a reliable baseline was established for levels of agrichemicals in surface and ground waters in the Basin. Less of an issue, except in the

minds of a small number, was the issue of adequate testing of the Basin itself and whether it sufficiently identified and weighed the contribution of point sources of contamination and other factors.

- The public release of data. Participants discussed the impacts which their work might have on the farmers in the Basin and the general population of Iowa. The timing of some information releases was also brought up.
- The recasting of major agencies. During the lifetime of the Committee/Consortium, Iowa went through major agency reorganizations within their natural resources/environmental regulatory branches; and also within their conservation and agricultural divisions, which resulted in 1986 in creation of the Department of Natural Resources and Department of Agriculture and Land Stewardship, respectively. Participants had to cope with their own shifting duties and changes in their agencies while trying to maintain circumscribed roles within the Committee/Consortium.
- The scope of their mission. In some respects it was very useful to have included in the membership individuals who reminded the group that their primary task was to aid the Northeastern portion of the state and the Basin area farmers who cooperated with them. When additional layers of project scope were added, advocates of these provisions were obliged to defend them, so the end product became stronger and the process used to create BSBDP became internalized by all participants.
- Vast changes independent of the group. in almost every sector relating to agriculture. During the lifetime of the group, there were enormous upheavals within the farm community in Iowa. Directly effected by this was Iowa State University and Cooperative Extension Service. There were also major shifts in Federal policy which touched all branches of USDA and which also affected allied state offices. These changes, which were most manifest in the area of seeking funding, required ongoing discussions. While the task of seeking funds weighed on the group and may have caused some burnout prior to full funding, it is also true that the on-going crisis brought people together. Hallberg in particular devoted great amounts of time to drafting memos which ran to many pages, describing his efforts on behalf of the group to find funds. Other efforts went into helping fellow agencies.
- The industry response. There was never an attempt to exclude the agrichemical industry from the proceedings. During the formative period of the discussions, the Iowa Fertilizer and Chemical Association were relatively quiet participants. As the group moved into Phase II, which included statewide projects and portions of a state groundwater strategy, IFCA did register its concern regarding various points: that Northeast Iowa was unlike the rest of Iowa; that more research needed to be done before changes in farm practice should be aggressively pursued; that farmers and the agrichemical industry could be seriously harmed by cutbacks in input use. Independently, IFCA also pursued some solutions on their own, when it became clear that inertia favored restricting agrichemical use. They also aggressively fought passage of the Iowa Groundwater Protection Act in 1987. Significantly, most of the legislative initiatives were not harmed by IFCA's early participation in the Committee, and the work of the Committee was not damaged by IFCA's presence either.

The only way that such formidable barriers and areas of potential conflict could be handled over a multi-year project was to incorporate the problems -- and the promise of solution -- into the project itself. BSBDP became the vehicle to ease these interagency problems, to reduce friction between participants, and to offer individuals the chance to reach their personal and agency goals. It was a powerful imperative for cooperation.

GETTING PERSONAL

As with anything remarkable, people's memories can differ on specifics with regard to who did what and when in the sequence of Iowa's groundwater initiatives. But there is remarkable consistency among the participants of the Committee on the chemistry and on the process which came out of the group effort. Some further thoughts on the care and feeding of a collaboration:

George Hallberg: "We tried not to hold meetings just to hold meetings. We made sure the issues on the agenda were clear. There would be general generic things -- like what agencies were doing to pursue the resources we needed, and also on the workfront -- have you done anything since we last met.

"And there were specific times when we looked to refining plans of action, which had to be put on the table. The spelling out, in black and white what you feel your agency's points of authority are and programs in the area of agriculture and water quality.

"It is a symbiosis that perpetuates self-appraisal and motivation to do something. For example, Extension might have the lead, but DWAWM would have a related program. So we would build a consensus on who took the lead on a major area -- say education, but include other angles where they are not doing enough.

"In the process we identified the gaps which we knew were out there when we put the turf on the table. There was no point in arguing over whose turf it was, but rather: this is the turf, it overlaps here, but there is no one covering this other area, so let's be realistic and work out turf arrangements.

"Consensus was also important when an interagency group would approach the governor or other agencies for money. An agency by itself could not do that. But the interagency group could.

"We also tried to avoid pointing fingers that would say: 'You are part of the problem'. We were all part of the problem. That was especially heart-felt by Extension. Some people, including many farmers, were saying that Extension was the problem. But we also said that they had this network of people out on the front lines who had to be part of implementing these solutions.

Gerald Miller, Extension Agronomist, ISU: "Obviously we couldn't go up to Big Spring and do four or five more years of research -- not with the local interest and involvement coming from the grassroots. While additional research was being conducted, we needed to take something off the shelf and go out and implement that on the farms. So we put together a survey in 1984 which gave us a mechanism to analyze local attitudes and inventory what people were doing. It was that teachable moment which Jerry DeWitt talks about -- farmers were ready to do something."

Roger Koster, formerly SCS, now Extension Associate: "At some point, individuals thought there would be a synergistic effect if we gather our resources together. The situation evolved over a long time of people talking, and farmers questioning us, talking on our councils and boards. We asked IGS to come up and take a look for us. And back in '81 and '82, a lot of farmers even began taking samples for IGS.

"From the standpoint of SCS, we were using a number of practices which were designed to make as much water as possible soak in, instead of letting it run off. If infiltration of nitrate was the problem, then we needed other soil conservation practices. "

Bernie Hoyer, IGS: "IGS was in a nice position, because we weren't the center of the storm. The storm was going to be how people had to react. We were researchers. We were a neutral party. We were just this outside group of eggheads. We weren't entwined with the political sides to the environmental agencies or agricultural agencies.

"Maybe that is why we have always found farmers to be so cooperative. We sent out letters through the ASCS office to tell them that we were coming to sample their wells. And in a couple of places we got there and notes were posted on their door, saying that they were sorry that they had to be gone that day, and if we would come back another day they would be happy to let us in to take water samples. People didn't have to do that, but that is what they did. The agricultural people were very concerned about handling people properly so that they not feel like guinea pigs. Mostly nobody knew what the sociology was going to be.

"The other thing typical of Iowa is that we didn't have any money. You are so starved for funds here, that you have to actually go talk to the guy in the next office or agency to see if there aren't things you can do together so you have a chance to accomplish what you want to do. You find out that if you have things going in the same direction, both of you can get ahead on the same dollar. Of course there are limits to this, but like anything else, the first dollar counts the most. For us, in some ways we have not learned much more than we found out with that first \$20,000 study. The next \$5 million went to get this into implementation."

Jerry DeWitt, Associate Director ISU CES. "I inherited the groundwork which Vivan Jennings laid and became co-chairman in late 1984 or early 1985. We were trying to develop a strategy at that point. We were sort of up against the wall. We did a lot of talking. We were not making too many inroads.

"Why did it work? There are several reasons. The chemistry was just right with the key actors. You have a Hallberg, a Hoyer, a Gerry Miller, a Jim Gulliford – people who were not primarily concerned about their own position or the accolades they would receive. They were truly in it for the good of the state and the outcome. They were not protecting their own turf. They represented their agencies well, but there was a bigger calling than to make your agency look good.

"Some of them had known each other for a long period of time. There had been a lot of groundwork laid. It was not like people were brought in and told: now you have to get along. So what other agencies can learn from this is that when you invest in such a project as this, it is very logical to pick the people based on their title and position. But in the long run that doesn't necessarily give you those connections and chemistry. The right person might be someone with another title, who can get the work done and has the right chemistry to represent the agency. In the Karst Committee, you did not necessarily see the top person in each agency as the key actor. People with the titles were informed and aware of what was going on, but they were not the ones down there going to the meetings. It was the people at the lower ranks who had the chemistry and the connections that got the work going.

"The people at the head of their agencies did not exercise their demand that they be given power positions. We took pains not to formalize the formation of this group and actions. Because once you formalize it, then you almost have to get Agency approval. By working informally, discussions were freer. One could talk and express ideas and not necessarily say: 'This is what my agency thinks'. If the meetings had been formal, it would have slowed the process and made the meetings less productive. We took very few votes. There was consensus-taking as opposed to a lot of voting.

"Trust was the key word. When George Hallberg went to Washington, he was not trying to protect the turf and tail of IDNR. He personally talked about the value of Extension and the need to give it a role in these kind of programs.

"The other thing was that there was a great deal of informal sharing of ideas -- communications by telephone late at night, early in the mornings, weekends, copies of letters. There was a great effort not to surprise somebody.

"Then the events of the 80s contributed to this model being successful. We were all sensitive to the changes. The right people had experienced change and had their eyes opened.

"From what I could see in Extension, here was an excellent model [BSBDP] of education and demonstration that we could document to show the changes of behavior that would take place. Here was an opportunity from beginning to end, to show the value of an educational program and the resulting changes in behavior. Then these concepts can be implemented in other statewide programs. Big Spring was the first step.

"I have been very pleased with the acceptance of a new philosophy and new mission at Extension -- the Greening of Extension. The toughest thing on all of us in Extension is to place ourselves in a neutral position and not pass moral or ethical judgment upon our clients, to a response to what they want. And that is tough for us to do, because the whole society and much of agriculture has gone through a period of being driven by profit. Now, there are a significant number of farmers who say that in addition to profit, they are also concerned over the environment. Extension has done a tremendous job on the profit end of it, but we have not done as good a job on community and society and the family and the intangibles."

Rick Kelley, DWAWM and now IDNR: "I met a lot of people in the agrichemical industry who were very open and willing to look at what we were doing and say, 'Jeez, this looks correct. You are talking about our products, but we think you are right'. Unfortunately, the number of those people and their positions in the industry is about like the number of people on the second floor [of the Iowa governmental, Wallace Building] and their positions in government. They weren't in a position to bring about change in the industry."

Morris Preston, DWAWM: "The Department of Water, Air and Waste Management was viewed as a regulatory agency -- that is how we solved environmental problems, by adopting laws and rules and issuing permits and citing people for violations. So we were viewed with a bit of mistrust in the agricultural area, because they certainly didn't want anybody fined or regulated. And agriculture has typically handled problems with education and incentives. So there was concern that DWAWM would require programs for applications of pesticides, or ban certain pesticides -- which we really didn't feel we had the authority to do.

"I would have thought that someone from Extension would have been better to head up the Educational Task Force [which Preston chaired]. But there was a conscious effort to involve other people on committees -- not just the people that were most directly affected in terms of the benefits.

"I never anticipated that there was going to be any regulation of farmers. I didn't see that as an option or implementable. The people we regulate in terms of permitting are typically small in number. You can't really permit farmers the way we tend to permit folks in our agency. I did wonder if we might be able to tighten up pesticide regulations. I think we were realistic about the role regulation could play -- with the primary emphasis on demonstrations.

"Farmers are not the problem. But they don't have expensive treatment systems or deep resources. Our challenge is to get information to them which they can use. It is more of a question of undoing the instructions and teaching and philosophy that has been placed out there since the late 60s. I really don't think regulation needed to be applied as a driver to bring people into changing their practices."

Lyle Asell, Assistant State Conservationist, Water Resources, USDA-SCS. "To make something like this [the Iowa Groundwater Initiative] work, you have to be a little naive. You have to believe in the tooth fairy and a couple other things. Essentially, you have to believe that good will be rewarded. Our job is to package people with money. But you have to get the right person. You need to understand the organizational structure: who has responsibility for it, and who does the work. Sometimes, the two are different."

THE PROPOSAL

The BSBDP proposal which was drafted in February 1985 called for \$6,786,151 over a 7-year period, including \$4,427,389 of external funding. The concept was to concentrate resources and coordinate inter-agency activities not only to enhance efficiency, but also to make this a more appealing project for grants and federal funding. Like a nuclear reactor, the individual energies were concentrated so they were able to reach critical mass. In other places around the country, including Washington, those same energies were also operating. But for various reasons there has been less real coordination in many other places.

These facts are historic and valuable for the innovations which Iowa brought to the area of groundwater protection. But most important to keep in mind is the process behind the work. Where that chemistry is present, any consortium -- be it in Iowa or elsewhere, for groundwater protection or a very different purpose, will have considerably greater chance of success. In subsequent chapters, this report explores in more detail the precise nature of the empowering cooperation which went on with the Committee, BSBDP and subsequent water quality projects in Iowa.

SECTION II. CHEMISTRY

Time-Line

- 1985-1986. Various hearings in both U.S. Senate and House committees on aspects of groundwater protection/pesticide dangers.
1985. Bugenhagen Subbasin Demonstration Project begins.
1985. Seek funding from foundations -- without success.
1985. At least two long series in Iowa's leading newspapers on BSBDP and/or threats to groundwater by pesticides; dozens of other single articles in broad cross-section of state and local publications.
- September 1985. Senator Tom Harkin of Iowa inserts floor language for support of BSBDP into agricultural appropriation bill, HR 3037.
- 1985-1986. Series of regional and national symposia and reports by the Environmental and Energy Study Institute from Washington.
- 1986.
- BSBDP participants address National Well Water Association meeting held at Omaha, give Keynote Address.
- Formation of the Iowa Consortium on Agriculture and Groundwater Quality, from the Ad Hoc Committee recognized to coordinate statewide groundwater quality issues, including BSBDP. Co-sponsors, and participants, remain essentially the same.
- Additional cost-share funds from DSC, SCS, ASCS become available which allow moving ahead on BSBDP.
- State agencies reorganize into Iowa Department of Natural Resources, which includes DWAWM, ICC and IGS; and the Iowa Department of Agriculture and Land Stewardship, which includes DSC.
- Working draft of Iowa Groundwater Protection Strategy is created.
- Several unsuccessful bills are introduced at the State level relating to groundwater contamination from major sources, also proposed taxes on pesticides and fertilizers for funding of sustainable agriculture research and allied areas.
- Passage of a statewide farm demonstration model, Integrated Farm Management Demonstration Project, with \$1 million of oil overcharge funds, uses BSBDP project and authors for design.
- Various reports by Rick Kelley of IDNR showing pervasiveness of problems with agrichemical contamination of groundwater, and also supporting that there is a correlation between well depth, protection for the aquifer and resulting amounts of groundwater contamination from agrichemicals.
- More speeches and talks by Consortium participants, including National Water Well Association, congressional Subcommittee on Toxic Substances, and Freshwater Foundation Conference, Chautauqua Conference on Groundwater Protection.
- Expanded reporting on groundwater problems in the press, including 6-part series in the *Des Moines Register*; related articles begin appearing on cutting back on inputs, farming more sustainably.
- Steve Padgitt of Iowa State conducts detailed surveys of farmers in Floyd-Mitchell area and also at Big Spring. Other surveys of farmers are done on their attitudes towards agrichemicals and pollution of groundwater, and *Des Moines Register* conducts an "Iowa Poll" on the issue.

Iowa legislators fund their own public opinion poll as part of the anticipated Groundwater Protection Strategy (GWPS) which is going to be introduced in 1987 General Assembly.

Interim study sessions are held with legislators and appropriate state officials and experts, including several BSBDP participants.

Legislators begin series of public meetings across the State to get input for Groundwater Protection Act (GPA) from citizens and to learn of people's concerns over groundwater contamination.

Iowa Fertilizer and Chemical Association supports Dr. Alfred Blackmer's research with a tax increase on fertilizer which helps finance his work on nitrogen fate and reliable nitrogen testing. IFCA also proposes that Iowa State University look into creation of a Center for Better Management of Agrichemicals, which they would support.

1987

Consortium holds public meetings in Des Moines to emphasize the coordinated effort in the State approach to groundwater protection.

Final GWP Strategy released and GPA, to become known as HF 631, is delivered to legislature.

A group of six legislators, including five Democrats, takes on major responsibility for guiding the 10-year, \$230 million plan. Legislation runs 130 pages, including the Environmental Protection Committee Report, authored by B. Hoyer.

May 11, 1987. HF 631 sent to Iowa Governor Terry Branstad for signing.

Overview

Many reports of Iowa's groundwater program emphasize the State's good fortunes to have the natural agricultural lab, Big Spring. And it is true that you will not find an equivalent situation in the United States which combines optimal hydrology and extensive conventional farming practices. But George Hallberg points out that the uniqueness of Big Spring made it an anomaly. Nothing else being done by the U.S., including the Chesapeake Bay cleanup project, was as comprehensive as BSBDP in terms of research/response/demonstration sites. National funding sources had not caught up with BSBDP in their criteria. They didn't know how to classify the work, encompass its vision or risk funds in support of it.

Therefore, when Hallberg made trips to Washington on behalf of the Committee and later the Consortium, he frequently heard that BSBDP had to be treated as a separate entity. The competition for limited federal funds was intense in 1985-1986, and Hallberg found that many foundations had not yet developed an awareness of the needs for groundwater protection or sustainable-low input agriculture.

It is easy now to forget that Iowa could not sustain major funds for their 4-Mile Creek Project. There was only limited funding for the much touted Rural Clean Water Project -- and none of that for the BSBDP. In fact, several participants interviewed for this report said that the period between the final drafting of the grant document in March 1985, and work through the Consortium on the Integrated Farm Management Program and Groundwater Protection Strategy, was a very tough time indeed. Many foundations were approached, and there was almost no positive reactions. Meanwhile, the project was sustained with funds from staunch supporters within federal agencies who managed to channel small amounts of cash into the project.

CHAPTER 3: ROLES AND PLAYERS.

What kept it going is personal chemistry. The institutional barriers were formidable. They included being in a small state with almost no discretionary funds for groundwater protection; no massive infrastructure from which to create an Office of Groundwater that can oversee the effort; or the rather terrifying knowledge that they were going after *The* state institution: agriculture.

They accepted all this, and with clear-eyed professionalism they met those challenges. Very likely they could never have done it without empowering the right *people* with the right *projects*. But that is what the committee did. It freed state regulators, for instance, to think about education and technical assistance which could cause voluntary change. It took researchers at one of the country's leading conventional agriculture colleges and turned them loose to do some very alternative kinds of work, and they responded energetically, even when this risked their professional careers. It gave agricultural educators a rebirth and a new perspective on their work. It involved many people in ways so revolutionary that they have only now begun to fully appreciate everything which happened during the implementation period. It also provided a way of approaching problems, which has produced innovations beyond the 1987 Groundwater Protection Act (GPA) in both water quality protection/farm management, and broader environmental issues and energy conservation.

Empowerment also means matching roles with people. This is trickier business, but it is very essential. For the committee to exceed the usual accomplishments of an ad hoc arrangement, or even a more permanent inter-agency entity, people must be identified who naturally assume roles and who can expand with the potential which is offered to them. Some persons took on more than one role, and some persons shared a single role. Here too, Iowa is a model.

THE ROLES

In the case of Iowa, the cast of characters included these:

The visionary

This person sees the immediate project within a larger framework, which includes a knowledge of most current research and legislative policy. The person is less revolutionary than enthusiast, ideally; and a thorough synthesizing agent.

An internal facilitator.

This person is most interested in maximizing the performance of persons or subgroups within the group. He likes to work behind the scenes to develop creative relationships, identify talents and smooth out personal agendas so that a group consensus can be achieved.

An external facilitator

This person or persons has strong links between State agencies and the national rubric of allied experts or interested parties. This person is not only willing, but probably enjoys becoming immersed in symposia, information exchanges or otherwise freshly telling the group's story yet another time.

The pragmatist.

With the Ad Hoc Karst Committee, it helped to have a local pragmatist who reminds the group of the real client population they are serving.

The local conscience.

There must be someone who speaks for the end users of the project. Researchers and regulators, and even educators at times, can forget that they have come together to solve a problem or series of problems in a specific area. This is almost inevitable when you have a multi-tier approach, as was true of BSBDP, including policy decisions and general educational guidelines as ultimate goals. This person should probably be in a position of having to carry out much of the work of the group, so that the practicality and challenges of their recommendations are almost immediately apparent to them, as well as any neglected areas of need.

The neutral moderator.

In the Iowa situation, co-chairs were selected with the least 'stake' in interagency skirmishes over turf or funds. They were respected for their integrity, and had the ability to guide discussions back to the agenda without offending others. They were also viewed as being client-oriented and solution-centered.

A dedicated administrator.

While the visionaries and networkers are doing their remarkable things, there must still be someone who has sat on enough committees to know the daily-weekly tedium of memos, minutes, deadlines, agenda and rules of order which must be exercised.

A documentarian.

Someone, and it may be most wise to limit it to a single person, has to become the voice of the group. It will not be an easy task. It means talking to people extensively in private to create a sense of the writer/historian's philosophy, and to also absorb the collective thinking of the group. For an important activity, however, it is vital that as the group evolves into new areas which become progressively audacious and forward thinking, that these steps be chronicled in consensual documents. This allows the group to feed on the collective energy and to register their progress.

Fellow traveling facilitator/mentors.

The Iowa group involved some of the best federal-level people that they could practically involve. Their enthusiasm infected federal agents, who in turn worked in their behalf for national funding. These people also offered valuable information to the group on future federal actions, on work being done elsewhere, on grant and other funding sources.

The above roles help evoke the necessary group chemistry. But to this core must be added a wider cast of persons who also recognized the opportunities and responded to empowerment and creative thinking. These include educators, environmentalists, legislators, farmers, researchers, scientists, regulatory persons and members of the loyal opposition. They were the ones to create the substance of the projects. In many important ways, they inherited the energy of the original group and now carry on with the reality of the original vision. This transfer and normalization of the process is also essential to the project's success. They remain the people today who apply the Committee's perspective and ethic to on-going projects.

CHAPTER 4: THE LOCAL FRONT

The importance of the local base for the Big Spring project, and even with the subsequent Consortium, is critical to understanding Iowa's success. The farmers demanded attention to their real problems. They also formed an excellent focus group to gauge the success of educational programs aimed at changing their practices. Over the years, virtually every Basin farm family has filed a considerable amount of information with BSBDP. Some of the cooperators, particularly those in the Bugenhagen Sub-basin project, spent hundreds of hours with the project; from visits by touring groups of federal agency people to focus group meetings, to interviews with surveyors or journalists. In fact, when the Basin work began, Hosch and Koster were very concerned about the disruption to the lives of Basin farm families. For his part, Bernie Hoyer was pleasantly surprised by the group's cooperative spirit. Hallberg recalled that some of his most satisfying moments were in sitting down with farmers and discussing what they could do to reduce their impact on the environment. They genuinely wanted answers.

State and county records provided a relatively accurate picture of agrichemical usage in the Basin, as well as production of crops and livestock. Figures were broken down to the township level, which further helped to gauge hydrological impacts on the aquifer. From about 1981 to 1983, IGS accumulated fairly complete data on 230 of the 300 homesteads in the Basin, including details about nitrogen application, nutrient credits for spreading of manure and for alfalfa preceding corn. Often suggestions about changing practices would come up while going over these figures with the farmer.

IGS also devoted great amounts of time during these three years documenting well depths and characteristics, establishing monitoring sites, and perfecting the hydrogeological boundaries of the Big Spring Basin itself. In 1984 a very complete assessment of agricultural management of the 103-square mile Basin was done by Steven Padgitt, working with Jim Hosch, Jim Kaap of the Dubuque Area Extension Office, Gerald Miller and Jerry DeWitt. This can be viewed as the first *marketing* study of the new target audience. Their findings are worth noting here (see sidebar).

AN EDUCATIONAL EMPHASIS

A small group of BSBDP participants were involved in shaping the educational component of the project, particularly as it was manifest in farm demonstrations and model farms. The direction which the

SIDEBAR: FARMING OPERATIONS AND PRACTICES IN BIG SPRING BASIN, MAY 1985 REPORT.

During June and July 1984, working with Iowa State's Steve Padgitt, 208 farmers were interviewed by an Extension intern. Their farm operations covered 92% of the farm land in the Basin. The six-page questionnaire inventoried livestock and crop enterprises, water and sewage disposal systems on the farm, and farm practices. For this study, the researchers chose not to ask questions about demographic or personal information, to protect the anonymity of the respondents. (Subsequent surveys did cover such areas, and attitudes on a variety of issues.)

The Findings

On the 208 farms, there were 307 occupied dwellings and 302 wells. Nearly all of the wells were cased. They ranged from under 100 feet (21%) to 100-200 feet (27%) and 200 to 500 feet (41%), with six percent going deeper. Of the wells tested, 62, or 35% were found unsafe from either bacteria,

Sidebar continued;

nitrate or both. Thirty percent of farms used a septic tank and drainfield, and 64% a septic tank and pipe, while three percent had a pipe only.

Basin farms averaged 290 acres, or 28 acres larger than the Clayton County average. Ninety-eight percent of farmers grew corn, and that corn accounted for 52% of all farmland, with another two percent of farmland growing corn for silage. In Clayton County, 37% of farmland was devoted to corn. For the Basin, that meant 32,490 total acres planted in corn, or 157 acres per farm, ranging between farms of from eight to 880 acres.

Hay was grown on 18% of farmland, pasture on 12%, oats on seven percent and timber on three percent. Farmers reported a difficulty in raising soybeans on erodible hills, and only two farmers did actually raise beans, for a total of 30 acres. There was about an even split between legume hay (58 acres) and legume-grass mixture (49 acres), with 90% of farmers growing hay. The average acreage of oats was 26 acres, by 79% of the farmers surveyed.

Sixty percent of farmers raised hogs and 59% milked cows. Forty percent also had beef cattle. There were also some lamb and two large poultry operations. In total, that amounted to 100,000 hogs, 12,000 dairy cattle, 1,900 stock cows and 7,700 fattening cattle. The aggregate for corn production was four million bushels, or 128 bushels to the acre.

Some telling statistics began to emerge when the surveyor asked about farming practices. For one thing, the average yield goal for corn-- the amount of corn the farmer expects to grow on his land, was 143 bushels, or 15 bushels above the actual yield. This discrepancy was consistent from year to year. In other words, the soils of Clayton County simply could not deliver higher yields, irrespective of inputs of fertilizers.

The crop rotation of choice was three to four years of corn followed by oats and meadow. Sixty percent of farmers used that as their basic rotation. Over half of the corn, 17,000 acres, was classified as 'continuous corn' by the farmers, meaning it was in at least the third or fourth year of growth in the rotation. About 20% of corn was first year after alfalfa.

Field cultivators and spike tooth harrows were used by almost all of the farmers, but on less than half of the fields. At that time, no-till corn acres amounted to 500, or two percent of all corn grown, with only 16 farmers trying that conservation practice. No farmers were trying ridge-till in 1984.

About 58% of farmers surveyed used soil tests at least once every three years, and another 20% tested every three to five years, while 20% never tested. Among the farmers who did not test, equal amounts said they had their own method for figuring out what to apply, others relied on dealer recommendations, on ISU recommendations or on the cost of fertilizer; and some farmers used more than one of these methods.

The researchers found that farmers tended to apply more fertilizer for continuous corn. They did apply less nitrogen to first year corn after alfalfa, but still far more than they really needed. Most corn ground had nitrogen spring-applied (85%), 10% of corn ground had both spring and fall applied and five percent had only fall applied.

Atrazine was the herbicide of choice with over 90% of farmers, with 70% also using Lasso and another 65% Bladex. Almost half (49%) relied on Counter as insecticide. The survey figures tended to exceed slightly state surveys of pesticide use in percentage of farmers using the respective products. In all, about 175,000 pounds of active pesticide ingredients were applied, or 5.4 pounds per acre of corn, with 85% herbicides and 15% insecticides. One-third of all pesticides used, 61,000 pounds of the total, was atrazine. The survey found that in three of the Basin's 12 quadrants more than six pounds of active ingredient per acre was applied, with a slight correlation between larger farm operations and higher use of pesticides.

Sidebar continued;

One-fourth of the Basin farmers who raised hogs had total confinement operations, while the rest used partial confinement, open lots or pastures. A third of farms stored liquid manure, and the others scrape and haul the wastes away. For dairy operations, manure handling was mostly scrape and haul varieties. Two-thirds of the beef cattle were in confined feedlots at least part-time, again with almost all scrape and haul manure management. Farmers usually used spreaders, and applied manure to 14,000 acres of row crops and another 4,000 acres hay or pasture. The researchers calculated that about 4.5 million pounds of nitrogen was produced by the manure. In addition, area farmers applied 4.8 million pounds of inorganic nitrogen fertilizer.

The researchers estimated that as much as one-half of the manure could be utilized as fertilizer, or up to 126 pounds per acre of corn. Adding credits from alfalfa, and collectively there was 7.8 million pounds of nitrogen applied in the Basin, or 130 pounds for every acre, and 239 pounds for every corn acre. Based on average yields of 128 bushels of corn, that means 5,068,440 pounds of nitrogen were actually needed, leaving an excess of 2,716,309 pounds of nitrogen -- or 45 pounds per general Basin acre or 83 pounds excess per corn acre. "Interestingly," the report said, "this amount is similar to that reported by Hallberg, et. al. (1984) for the 82-83 water year. Their measurements showed 43.3 pounds of excess nitrogen per basin acre, divided fairly equally between ground water and surface runoff."

This inventory shows that Basin area farmers had opportunities to change their practices and gain significant reductions in their expenses, very likely without damaging their crop production. The inventory also suggests that these farmers were already doing many things right, in the sense that they had a livestock-crop balance; and while there was some reliance on continuous corn production, they also required hay and pasture for their animals. *The situation was very exploitable.*

demonstration projects took was towards holistic management; addressing simultaneously the issues of soil erosion, water quality, energy conservation and reduction of unit cost. And while designers had knowledge of aspects of this approach, with models from other farm settings they could apply to the Basin, it was still necessary to learn from the Basin farmers precisely what worked and what did not work for them. So on a fundamental level, the end users assisted in the educational component design -- even to its application at the state level and beyond.

THE LOCAL CLIMATE

At Big Spring, there was considerable awareness of the vulnerability of the water system. Back in 1964, for example, the Gunder Cheese Company had emptied its whey pond into a nearby sinkhole at the north end of the watershed. It was late December and it is very likely that the company felt that the material would not go anywhere for some time. But within a day an odd smell was noted at the Spring, at least 10 miles to the south. Otto Banks, fish biologist at the hatchery, found that the oxygen levels were down in the water. By morning, trout began dying. Eventually, all 122,000 fish were lost.

There would be other less dramatic incidents which effected the economic well-being of the hatchery. Banks remained a vocal and public critic of the kinds of farming practices which were gaining popularity in

the area, and which were also affecting the groundwater with increasing regularity. Closer to the actual initiation of BSB DP, local farmers were also enlisted to help map sinkholes in the area. This made them more aware of the vulnerability of their terrain.

But there was also another force working on the Basin farmers. Like other Iowa farmers they arrived in the 1980s with nearly 20 years of sustained economic growth in the farm sector, partly because of the increased use of agrichemicals. Because of agrichemicals, farmers worked less and earned more, and produced far more than their ancestors had. This axiom was less true in the Basin than it was in the 'flat land' areas of Iowa. In Northeast Iowa the geography still imposed limitations on what agrichemicals could do. Which is why the ISU inventory done by Padgitt showed that these farmers were not as chemically intensive as farmers in other portions of the state. But in the most general sense, Big Spring farmers also were leveraged in their debts and dependent on high inputs -- just as were other Iowa farmers.

But another factor was also at work in the Basin. Padgitt found a correlation between the perceived seriousness of the problem and proximity of that problem to individual farmers. People will not ascribe to their own farms problems which they readily point out are present on other farms.

So many questions remained: will Big Spring farmers accept that they are causing problems, and will they voluntarily change their practices? What will it take to get them to change? And can any of this behavior modification techniques be generalized to other farmers? These were the basic questions to be answered through the 7-year educational component of the BSB DP.

A RURAL SAMPLER

To help me assess the attitudes of area farmers, I visited with some of them. Here are their impressions.

Lorin and Phyllis Dettmann.

The Dettmanns are the kind of people who hold the rural fabric together. For years he was a soil and water commissioner. Phyllis was voted an Iowa Mother of the Year in 1990 and also has a full slate of responsibilities with social and civic organizations. It is easy to see why they would be leaders among farm families: they are friendly, unassuming, and open.

When Lorin learned about the Big Spring study, he tied it in to what he already knew about water quality planning through the Conservancy Board. Like many farmers, Dettmann felt that a certain percentage of his colleagues require stronger controls to keep them from employing destructive practices. These so-called 'aggressive' farmers, as Dettmann terms them, tend to push the system, whether it is yields or taking advantage of federal policies. "There was a number of years there where everyone was going 100% corn," he explained, "buying up extra farms had to be doing damage. They ripped out all of the fencerows, windrows and the soil just ran off."

Dettmann was skeptical, feeling that programs aimed at improving water quality would be abused in the same ways that other federal programs were abused by this segment of 'aggressive' farmers. Then he became involved in the programs. "I was skeptical, because you have 75 to 100 people show up and they produce about 60 ideas. And I was afraid the same thing was happening with the water quality reports."

He is honest in saying that he has seen both kinds of farmers. There are still farmers who abuse the land and who take advantage of federal programs. He believes that the CRP has encouraged that, and with the conclusion of the program in 1995, there may be even more abuse. "Will the government force the people to graze those acres, instead of plowing them up. If people had an incentive to put cattle on those sections - that would be an answer."

David Monroe.

Monroe represents one of those farmers who has made a very long journey from initial skepticism over the BSBDP recommendations, to strong defense of some of their new practices. He milks about 50 dairy cows on 300 acres of land, which he is buying from his father. His first contact with Basin project personnel came when he spotted George Hallberg pulling a water sample from Silver Creek, which flows near his property. Of course he went over to see what was going on. The two men discussed excess nitrogen and the dangers associated with pesticides. Hallberg told Monroe that another concern was over so-called inert ingredients used in pesticides, which might be toxic, but which were very hard to identify in water because manufacturers did not need to disclose their composition on product labels. After their meeting, Hallberg sent Monroe a report on Big Spring. "I read most of it," Monroe said. "It showed about the different chemical levels at different times of the year - the rate that it comes out at Big Spring. And May, June and July the chemical levels are quite high. That is how we got started."

What he started in, eventually, was the manure management program, in which an agent of the BSBDP project does periodic analysis of the manure produced by his dairy herd. He then advises the farmer on how to better utilize the manure on his crops. Monroe hesitated before joining the program. He associated it with 'sustainable' or 'alternative' farming, and there were two local farmers who practiced these methods, whose lifestyles Monroe did not respect. Then he read the manure trial results of neighbor Gary Burrack in BSBDP's newsletter, *Water Watch*. When he saw how much nitrogen was eliminated, he decided to enroll.

Monroe is president of the Board of Directors of the Luana Coop. His move sparked a little controversy at the Coop. His own feeling is that he realized that even though this was a farmer-owned company, it was oriented to making profits first, which meant selling more agrichemicals and other farm products.

When Hallberg brought by a busload of 40 Canadian visitors, Monroe's farm was one of their stops. "I said to them that I cut my fertilizer bill in half," he recalls. "They looked at me like I was crazy. They have to realize that where I started from was when the Coop said your manure is worth nothing -- you need plowdown starter and anhydrous. I eliminated the plowdown. Then on alfalfa I eliminated the anhydrous. Now we are cutting down on starter. And we also sidedressed anhydrous instead of putting it on in the spring, which saved 25%."

Farm policies bother Monroe a lot. The end of dairy price supports meant that he had to lay off a hired man he had been using. He and his wife have not taken a vacation since then, nor can they see a time when they will be able to get away from the cows. That so bothers him that he has thought of selling off the dairy herd and only raising beef cows.

He tries to rotate properly, and to be responsible, but the combination of commodity programs with their requirements and payoffs, restricts what he can do. On the other hand, he is bothered by watching farmers who take advantage of other aspects of farm policy. He points out a conservation-oriented farm in the area which had been rented to a conscientious farmer. That farm was bought by another farmer in the area who is using it to increase his corn base. He just buys farm after farm after farm and plants them in corn -- come hell or high water. I don't know what good the project is to him."

Harold and Ida Kuntz.

A decade ago the Kuntz's agreed to allow IGS to sample their well water. And for 10 years that is what has happened on a regular, and sometimes irregular, basis. Ida said that with rainstorms and other weather events, it is not unusual to see a DNR truck pull up at almost any time of the day or night. They get used to it.

"It is nice and easy access," Ida explained, "and they told us that if we get a real heavy rain, they might be here in the middle of the night to check for contamination from runoff."

Test results have shown periodic elevated nitrate levels. If they have pregnant women visit, the Kuntz family makes sure there is bottled water on hand for them. They were glad to have the information.

The Kuntz's rent their farm and have nonfarming jobs. She works with a hospice center. He is a carpenter. When BSBDP moved into a phase of the program which included the plugging of abandoned wells, the Kuntz

well was selected as one of the first for the area. The unused well is only six feet from the well which they presently use. The challenge of plugging a well so close to the active one appealed to the demonstrators. Roger Koster told them to get their machine shed ready for the little lecture which would go with the closing. "We had about 50 to 60 people show up," Ida said.

Bill Eno.

Bill is a big man who looks out on the world with a certain degree of criticism, especially where the government is concerned. On his 240 acre farm he has many conservation practices, some of them put in by the sub-basin project, others done on his own. "I believe in conservation," Eno said. "Yes, I get a little disgusted once in a while when things you think are right get turned against you. I don't think my attitude has changed too much. I was ahead of some of the rest of them on conservation anyway. I don't really think the rest of them have changed their attitudes too much on conservation either."

Eno gives as an example, the encouragement to grow oats a year ago. Farmers were told that there would be a large market for oats, since Americans had discovered the value of eating oat products. The problem for growers in the Basin area is that oats were not heavy enough in 1990 for the major buyer. Canadian oats were purchased instead, and Eno received little for the crop.

He has also been upset with the wetlands policy. He points out that the government has employed a new technological classification system which would presumably identify wetlands and other lands very efficiently. Eno said that his best pasture, as well as the farm yard and part of the barn, were designated as 'wetlands' by the computerized model.

"I don't know whether some of these ultra-environmentalists listen or not," he said, "but my message to them would be: 'Keep in mind (that) we have to make a living farming this some way or another. Don't get too rough with the rules'."

Darrell Kifer

Kifer is manager of the St. Olaf Feed and Grain Company. When the project began in the Basin, Darrell attended meetings to see what it was all about. He accepted his responsibility for some of the problem. In fact, his company is switching to dry pesticides, which have less potential to spill in places where they are not wanted. He has also thought about offering more consulting and less product in his business. But the problem, he said, is that some farmers have come to see advice giving as a free service -- particularly the so-called Big Operators, who expect much more in terms of fringe benefits for their order than does the smaller scale farmer. That is going to have to change when suppliers like himself move away from chemical sales as their sole revenue source.

"Farmers themselves need to be open-minded," he said. "There are those farmers who say - I am not about to change. I have been making money doing it this way for 20 years. And you have other farmers who are changing faster than it is good for them - just to see what happens.

"The majority of our customers are not going to make changes all that rapidly. One, they want to see the results first. Two, from their standpoint, they may have to make equipment changes. They can make small changes, like lowering nitrogen input. But to buy new equipment -- it had better be better. Or the bandwagon you might be jumping on now, you might have to jump off in a couple of years, after you have spent \$15,000 for a new piece of equipment."

Kifer believes one of the biggest problems in Iowa is the movement away from mixed farm systems which balance livestock and crops. After spending several years in Northcentral Iowa, Kifer said he appreciates the livestock in the Basin, which allows for a broader rotation of crops. His personal feeling is that Iowa should use its ability to raise cheap grain as the basis for supporting an increased livestock segment. "We have the cheapest grain in the United States here in Iowa," he explained. "And we can produce a pound of meat cheaper here than anywhere in the country."

One thing that did surprise Kifer was the thought in the minds of some people that the Basin project was something of an extravagance, in that the state was paying for "all the vans running up and down the roads, and people taking measurements on these creeks. I don't think many times they understood the largeness of the project. There were maybe two or three projects like this in the entire nation. They had the project explained to them many times, but I don't think they realized how few projects like this there were -- this project has national significance."

Kifer has noticed that when farmers have reached the age 30 to 50 bracket, they get relatively set in their ways. This also corresponds to the growth of agrichemical-based farming historically. It is going to take a lot more convincing for those people to adapt to change than it is for the guy who is 25," Kifer said, "who is coming to this new approach during his career development phase, when he is typically more open-minded."

SHIFTING ATTITUDES

Over the years, Padgitt and others have documented shifts in the attitudes of Basin farmers. In August 1986 he included attitudinal questions in his survey. At that time, farmers grouped together on an almost equal basis their concern for the problems of water quality, soil erosion and profitability in agriculture. They also acknowledged that the problems they had with groundwater quality stemmed from agrichemical pollution of the water. They were personally worried about the quality of their own drinking water. The majority of those surveyed by Padgitt that year also felt there should be efforts made to protect the environment, even if it meant smaller economic growth in the future.

In 1987, BSBDP did a mail and telephone survey to update agrichemical use and other aspects of farm management. They found that since 1982, 52% of farmers had reduced their nitrogen fertilizer applications, 4% had increased theirs and 45% indicated no change. For insecticides, 19% had reduced, one percent increased use, and 81% had no change. Nitrogen used on continuous corn had dropped by 25 pounds per acre, from 174 to 149 pounds; while nitrogen applied to first year corn following alfalfa dropped from 115 to 89, or 26 pounds to the acre.

In reviewing the results of BSBDP, some critics have argued that since aggregate amounts of nitrogen and pesticides measured in the Spring's discharge have decreased from the earliest levels recorded, then this somehow invalidates the study. It has also been argued that farmers should not have been allowed to reduce their use of nitrogen and pesticides, because this jeopardizes the science of the project. More time should have been allowed to establish a baseline of data, these critics have said.

Proponents argue that the whole point of the project (at least a major one), was to have farmers adopt more economic farming practices, which also lessened the negative impacts on the environment. Therefore, when less contamination was measured in the outflow of the Spring, it showed that the project was working.

SECTION III. ACHIEVEMENTS

Overview

It took a lot of effort to keep the Big Spring Demonstration Project alive, even as a concept, until such time as funding arrived. BSBDP was an anomaly in many ways. It wasn't as large or visible as the Chesapeake Bay Project, but it was far larger than the typical program accepted into the Rural Clean Water Project. It was integrated and holistic, long before this approach was widely accepted for agricultural demonstration projects. In 1985 and 1986, the concept was novel enough to force potential funders to regard Iowa separately.

The memos and letters of various participants from those years are filled with frustration. Hallberg, who did much of the traveling to Washington on behalf of BSBDP, noted in his letters that Iowa was enormously respected by everyone involved in groundwater quality and nonpoint source pollution. He and other Iowans were continually testifying before various congressional hearings, or briefing federal agencies (and offices). The expertise which these people brought to the problems were used in forming national policy.

But privately, the group became frustrated at the allusiveness of full funding. The Ad Hoc Karst Committee went so far as to change their name to the Iowa Consortium on Agriculture and Groundwater Quality, hoping this would help. In this manifestation they were a more stable unit for funding. (Hallberg said an oft-heard comment in the halls of Washington was: "*We don't fund no Ad Hoc nothing.*") It was not a move easily taken. Several participants were concerned that by formalizing the organization they would give up the freedom they needed to think outside agency boundaries.

After Washington was not forthcoming with full funding for the project, participants began working on the creation of their own state revenue sources within the directive to develop a comprehensive groundwater protection strategy. At least a dozen significant problems were identified which needed to be addressed by a groundwater protection law. Each of these required some expenditures. The same holistic, long-term, nonregulatory approach which had been designed for agricultural nonpoint source pollution was worked out for these other state groundwater problems. The eventual package which was created called for a 10-year program with expenditures of \$230 million. Most of the funding would come from user taxes. Legislative supporters knew this would prompt opposition from special interest groups who were affected by the proposed taxes. But by 1986 and 1987 when Iowa was putting forth this legislation, it had the benefit of other state precedence in establishing similar taxes and fees. More trouble came from their proposed nondegradation policy, and from plans for closing all of the large agricultural drainage wells used in northern Iowa; closing of abandoned wells; and better protection of the areas around sinkholes.

Iowa was fortunate to have a legislature which was ready to act on a comprehensive environmental bill. Six house members were directly responsible for guiding what became HF 631 (the 1987 Iowa Groundwater Protection Act) through to its passage. Four of these legislators had extensive professional backgrounds in environmental-related issues. They provided a defense to the strong lobbying which was done to weaken or kill HF 631.

CHAPTER 5: THE BIG SPRING BASIN DEMONSTRATION PROJECT

In sports they talk about that rare player who can do it all -- a Michael Jordan who can score, defend and assist his team mates. That is the genius of the Big Spring Basin Demonstration Project -- it could do it all. The geography revealed how nonpoint source contamination occurs. Because there was a remediation plan connected with the area, farmers were not guinea pigs, but partners and colleagues. They tested new kinds of management practices and indicated what worked and what did not work. And because policymakers were also involved, the results of the farmer-research collaboration was transformed into realistic legislation at the state level. It was a total package.

BSBDP had a phased approach, which had the following overlapping sequence:

- 1) An educational-outreach program, whose objective was to increase Iowans understanding of the conditions of groundwater supplies, the cause of nonpoint source contamination and solutions. Best Management Practices (BMPs) would be promoted through Extension, including work with agribusinesses to involve them in the process.
- 2) Implementation-technical assistance. Farmers in the Basin would be encouraged to adopt BMPs through incentives and technical assistance.
- 3) Development-documentation of BMPs technical management models. Develop, demonstrate and evaluate management practices that reduce nitrogen losses to groundwater and promote other alternative practices.
- 4) Documentation-evaluation. The evaluation of BMP impacts on water quality; better understanding of the interconnectedness of surface and groundwaters; documentation of the economic impacts of changed practices on farms; and the effectiveness of nonregulatory strategies in changing farmer attitudes.
- 5) Policy development. Institutional changes will be identified which require innovative policy measures.

Both in Iowa and nationally, the first aspect of the Big Spring work to garner attention was the results of research which showed the amount of agrichemicals making their way to groundwater, and the attendant revelations as to how those chemicals arrived there. Doubtless this was important for mobilizing widespread state support for groundwater protection. But BSBDP was also working to reduce the amount of that contaminant by changing farm management practices. When contaminant levels did go down, critics used that data to argue that the original premise of the study was wrong, and the study was flawed. In point of fact, data from the spring corroborated the predictive model for changed management.

THE DEMONSTRATION COMPONENT

Irrespective of public perceptions, the most important component of the BSBDP has always been the demonstration/implementation program of BMPs. Farm demonstration projects have a long history. BMPs aimed at surface water supplies and soil erosion were not new. Strategies to move to low input sustainable management was not new. What was new in the BSBDP strategy was its holistic approach. The goal was an approach which allowed farmers to reduce their costs, maintain profitability, and also addressed environmental issues. These three objectives had not been teamed together in previous demonstration projects. In point of fact, they sometimes competed with one another. Some techniques may be best for the environment, but do

lower profitability; others enhance profitability, but do little to protect the environment -- or actually harm groundwater - the prime resource being conserved.

For BSBDP to work, farmers had to show whether the various BMPs were implementable. The obvious place to start was with management changes which would have dramatic positive economic impacts on the farm. The earliest projects developed in the Basin dealt with improving fertilizer efficiency through soil testing, split applications, side dressing and more realistic yield goals. Soon after implementation of these concepts, the Basin farmers were introduced to better management of alfalfa and its nitrogen contribution. Manure management was also introduced. Overall profitability was emphasized to the Basin farmers, rather than the old emphasis on maximum yields.

Reduction in nitrogen use was the most logical place to start. There were obvious abuses in the way Iowa farmers applied nitrogen. Few farmers used regular soil testing. Many simply multiplied their desired corn yield by an indexed figure to arrive at pounds per acre of fertilizer-nitrogen and applied that amount. They did not think of whether the soil was capable of growing this yield. And in fact, the first surveys taken of Basin farmers showed that they were over-estimating real yields. The correlation between excess fertilizer-nitrogen which eventually emerges at Big Spring and true yields was nearly a perfect one -- though likely fortuitous. Farmers had also failed to give themselves credit for the manure which was spread on their fields, nor were they giving enough credit for the nitrogen put back into the soil during their alfalfa rotation.

By calling attention to these areas of mismanagement, the researchers moved farmers towards enhanced profitability at the same time that they reduced their nonpoint source contamination contribution to the groundwater. They were also fortunate to have available a growing body of research and field results on new nitrogen application methods which had been devised for better soil conservation. This included such things as nitrogen shielding, nitrogen stabilization, the effects of multiple applications and varying rates, and the impacts of crop rotations on nitrogen. All of these strategies helped to protect groundwater, in addition to their benefits with soil erosion or protection of surface water supplies.

The program 'borrowed' other BMPs which were originally developed for soil conservation or low input sustainable agriculture or for energy conservation. These BMPs included reduced tillage, improved pest management, better rotations and other crop production methods. But they put these individual practices into a composite program for use as a system on the farm.

THE SUB-BASIN COMPONENT

The Basin was a proving ground to work on voluntary changes in farm practices, which eventually would be applied to a statewide program. But with limited funding, it was apparent that they needed a small group of farmers in an area of the Basin who could be measured independently for groundwater responses to changes in practices. If a microcosmic project could be installed which contained the elements of the overall strategy, the whole project would be validated -- with corresponding financial support resulting. Thus came the importance of the so-called Bugenhagen Sub-Basin project.

The Bugenhagen Sub-Basin watershed is 1100 acres of land which drains to a single sinkhole that could be monitored for groundwater quality in the same way that Big Spring itself was being monitored. In addition, 11 farmers had land which lay on the watershed, thus providing a good working group to show how changes in cultivation practices affected ground water quality.

Beginning with crop year 1986, 9 of the 11 landowners, who farmed 94% of the cropped sub-basin, signed cooperative agreements to implement fertilizer, pesticide, and soil conservation BMPs for seven years. The cost share for the project was provided through a fund by USDA-ASCS and Iowa Department of Agriculture and Land Stewardship (IDALS). The objective was that farmers in the sub-basin agreed to: 1) not apply nitrogen in the fall; 2) apply nitrogen preplant, sidedress, or split application during the crop year; 3) not apply manure or fertilizer to frozen or snow-covered ground; 4) use realistic yield goals based on soil type to determine nitrogen requirements for corn; and 5) adjust fertilizer recommendations for legume and manure credits. They were also encouraged to incorporate manure into soil; and to test manure for nutrients.

SIDEBAR: THE PROMOTION OF A DEMONSTRATION, *WATER WATCH*

The newsletter for BSBDP debuted July 15, 1984. *Water Watch* has been a relatively inexpensive way to broaden the impact of the Basin projects, and a vital component to any demonstration/implementation program. Initially, the chores of writing *Water Watch (WW)* fell on the shoulders of Clayton County Extension Director Jim Hosch. When funding became available in 1989, Kathie Bentley, a professional media publicist, was brought in.

The primary target audience for *WW* has always been the Basin farm families. *WW* is a forum to tell them about what is going on with groundwater quality in their area, to share ideas and the results of projects, and to bring in more general agricultural information that is appropriate. In the early issues, the focus was on advice relative to the management areas which had been identified for change: fall tillage practices, better handling of manure, computing nitrogen needs, alfalfa management. There was also information on home water treatment, and how to dispose of pesticide containers.

WW has always shared the results of surveys taken in the Basin, sometimes reporting here raw results which have not been formalized into finished reports. Readers saw their nitrogen usage, and saw how they stack up relative to other counties or states. Their opinions on polls also appear in these pages. *WW* has also been a forum for the opinions and explanations of extension staff or others involved in the project.

This sharing *created a community* around the issue of groundwater contamination and better farm management. The various tours and forums which have been held in the Basin are also written up in *WW*, making it local news. The forums and speeches made here, even when their ultimate audiences were state or national in character, were also reported in *WW* to continue this sense of local purpose.

As the projects have matured, there is increasingly more data taken from field trials and individual cooperators who are engaged in specific projects. There is also more general tips gleaned from the specialists, such as the integrated pest management scouts, perhaps advising every reader about the potential for an infestation of alfalfa weevils or black cutworms. The tone of the newsletter is so matter-of-fact that no farmer reading *WW* today will feel he is being pushed to do anything. If they want to take advantage of the information which is laid out before them, they are welcome to do it.

When Kathie Bentley took over the writing chores at Clayton County Extension Office, *Water Watch* was only one aspect of her work - and perhaps not even the most important. She began providing a growing number of area newspapers with copy on demonstration projects, informational pieces on farm practices, updates on water quality data and other details about BSBDP. She learned what editors wanted for publication, which often included photos and graphs, and she shaped the articles to fit their formats. She even began taking articles around on computer discs which could be directly fed into the newspaper layout. The results have been a proliferation of articles that tell of upcoming demonstrations and give summaries of ones just concluded. Many pieces have been put on the front page, reflecting their news value in the local area. Many of the newspapers were also outside the immediate area of Big Spring or even Clayton County. Not only has this brought more farmers to demonstrations, but it has enhanced the sense of community in the Basin itself. The role of media coordinator for Big Spring is partly responsible for why this region has responded differently than other demonstration areas which were subsequently established around the state.

WW has evolved from a local to a nationally distributed newsletter, with a circulation in the thousands.

The Project has provoked

- > articles and features in over 150 newspapers, 51 radio and 15 TV stations,
- > in every major farm magazine, numerous other magazines, journals, newsletters, and videos,
- > in at least 7 languages.

The relative compactness of the Bugenhagen allowed for extensive water monitoring. Much of the equipment was designed by Dr. Jim Baker at Iowa State University. He also brought to the Bugenhagen a three flume flow monitor used on the 4-Mile Creek Project. A constant monitoring station was set up adjacent to the flumes, dubbed the "Moon Hut" because it resides on Dwayne Moon's land. The flumes direct the surface flow and automatically sample the water, sending it along the lines into collectors located in the shed itself. During extraordinary rainfall incidents, investigators can manually sample the flows of water at any interval they wish. Water flows are registered on a computer-generated hydrograph which is also located in the Moon Hut. The position allowed researchers to gage and monitor both surface and underground flows which emptied into the sub-basin's sinkhole just beyond the station. The Moon Hut samples automatically for conductivity, pH and temperature; and equipment automatically collects samples for analyses for nitrate and pesticides. Manual samples were also taken on a weekly basis from several sites in the sub-basin.

THE INTEGRATED FARM MANAGEMENT DEMONSTRATION PROGRAM

The first successful large-scale groundwater protection farm demonstration program to receive full funding in Iowa was not BSBDP, but the Integrated Farm Management Demonstration Program (IFMDP). In some respects, this \$1 million per year program was a trial balloon, not only for BSBDP funding at the state level, but for the entire omnibus 1987 Groundwater Protection Act.

In August 1986, a small group came together on the campus of Iowa State University for an intensive week-long planning session to outline the plans and objectives of IFMDP. The legislature had already instructed the Iowa Department of Agriculture and Land Stewardship to develop a state-wide plan with a management advisory committee - the agricultural-energy management fund advisory committee. The membership of that advisory committee included the state institutions represented on the Consortium. After various planning meetings and discussions, Jim Gulliford, on behalf of IDALS, requested that George Hallberg, in concert with Gerald Miller of ISU and Duane Sand of Iowa Natural Heritage Foundation develop the coordinated program, which was done in August at ISU.

PREEMPTION

In many respects, IFMDP was able to preempt BSBDP by utilizing the large scale strategies which were worked out in those early Ad Hoc/Consortium planning sessions. Like BSBDP, the IFMDP approach was to create an educational program concentrating on integrated farm management to achieve reductions in energy use, enhance environmental protection and increase profitability. Early in the program there was identification of critical best available technology (BAT), but there would also be far more effort to integrate individual strategies into a farm-wide agroecosystem approach, "coupling appropriate tillage," the report said "nutrient, chemical, and pest management BATs within the context of conservation practices and soils and the individual farmer's crop production plan and management capabilities. This program will demonstrate reductions in energy consumption -- through reduced (conservation) tillage, and reduction in chemical fertilizer-nutrient wastes and pesticide use. The program will demonstrate environmental protection - through reduction in soil erosion and chemical runoff to surface waters and by reducing leaching losses of chemicals into groundwater, through the integration of nutrient and chemical management with conservation tillage, land treatment, and cropping sequences."

OBJECTIVES

"Through reduced energy and chemical inputs (and/or greater efficiency) the program will also demonstrate ways to enhance profitability in farming across Iowa. The documentation of these economic and water quality/soil conservation benefits will be utilized within an interactive educational program which will also key

on findings of concurrent sociological studies. Education/outreach programs will change public perceptions and attitudes, developing an understanding of the direct interrelationship among environmental protection/drinking-water quality - energy reduction - and farm profitability, enhancing further adoption of BATs, particularly for chemical and nutrient management."

There were four specific objectives for the 3-to-5 year program:

1. Fully implement field demonstration projects in every county of Iowa that include integrated tillage, nutrient, and pest management BATs;
2. Establish aggressive, innovative public education/agribusiness outreach programs to promote adoption of BAT to reduce energy consumption, protect groundwater and soil resources and maintain profitability;
3. Involve the agribusiness/agrichemical community to encourage their adoption and implementation of BATs for environmental protection and resourceful conservation;
4. Concurrently evaluate the effectiveness of these, and other programs, to identify, and continue reprioritization of institutional programs and agronomic research to further these objectives.

DIFFUSION-ADOPTION MODEL

IFMDP places a strong emphasis on the sociological-response diffusion-adoption model of behavior on the part of the farmer. Hallberg said of their approach that they felt that to correct some of the excesses of the past, in terms of the over-emphasis on high yields and maximum inputs, IFMDP had to use similar promotional techniques to 'sell' farmers on the alternative style of management. Close attention was paid to the delivery of the message; and the crafting of different appeals to broaden the potential user base for the project. Fortunately, the farmer concern over groundwater quality was a greater imperative than their imperative to maximize production.

"Given the current problems of farm profitability coupled with this new emergence of environmental concerns," the IFMDP proposal stated, "we have arrived at one of the most "teachable moments" of many years. The program strategy is designed to maximize these findings. In addition, the strategy involves an interactive approach with the evaluation process. Studies of farmer's perceptions, attitudes, and practices, and communication networking will feed back into education/outreach programs to allow targeting of efforts. Community leaders and innovators will be the focal point of the demonstrations."

GRADUAL CHANGE

As with BSB DP, because it sought to change farmer attitudes and practices, the IFMDP was expected to take several years to prove its effectiveness. In 1986, the authors were not sure that the reception which they had received in the Basin would translate into statewide acceptance for a similar project. To establish its broader applicability, Gerald Miller went so far as to deliberately select for one demonstration center a site completely unlike Clayton County. It was an area of large scale 'cash grain' farmers who had no reason to share the values of Basin farmers. Here, an equivalent to Bugenhagen was established.

SCOPE OF WORK

"The idea behind the Upper Bluegrass Watershed Project in Audubon County," Miller explained, "is that we would go in and select a small watershed similar to Bugenhagen, and work those producers in that watershed, put in some instrumentation, and basically demonstrate to the area farmers that they had problems out there with nitrate, pesticide and bacteria too. But it has been harder to get producers out there to jump on the bandwagon. Now they do not have a Roger Koster, but they have good local staff. But there just doesn't seem to be a focus of the local interest and the enthusiasm that is infectious like it is in Big Spring.

From its first year, IFMDP has been ambitious in its scale. In crop year 1987 there were 314 demonstrations established in every county in the state, with 80% of them located on private farms. There were over 5,000 test plots on these farms, to measure various crop management practices. As with the Basin,

a wide range of educational and promotional activities were conducted, including field days, workshops and seminars, press releases, articles, brochures and radio interviews.

In the continuing effort to determine what will work -- whether the area of the state is the Upper Bluegrass or some other site, IFMDP has undergone a remarkable number of permutations since its inception in 1986.

BSBDP GETS FUNDED

Full funding for BSBDP came under the 1987 Groundwater Protection Act. The intensity of the Bugenhagen sub-basin project was expanded to a Basin-wide effort. In 1988, there were 128 on-farm demonstrations established with area farmers, involving over 1000 plots. Some sites were co-sponsored by BSBDP and IFMDP. The demonstrations included alternative and reduced tillage methods; alternative equipment; nutrient -- particularly nitrogen management; rotation benefits such as the establishment of alfalfa, corn following alfalfa demonstrations; weed control; Integrated Pest Management for insect control; manure management; soil testing; plant population establishment; and vegetative strips to provide buffers around sinkholes, and possibly serve as energy biomass crops.

It is very possible there has been a synergistic effect by having both IFMDP and BSBDP. They have served different functions. IFMDP needed the work at Big Spring to galvanize state attention and to produce the data which IFMDP hoped to substantiate on a statewide basis. BSBDP primed the Iowa media on the issues of groundwater contamination, which then lead to more pro-active series of articles on farm strategies which reduced the potential for nonpoint source groundwater pollution; and opened up the whole groundwater protection issue that became the 1987 legislation.

Iowa's two leading newspapers, *The Des Moines Register* and *The Cedar Rapids Gazette* got into a situation of running 'dueling' articles and series on water contamination, nitrates in water, alternative agriculture or research results. *The Gazette* unveiled *Iowa Farmer Today* which has produced some of the best stories on the agriculture-groundwater connection. Many of those stories were reprinted in *The Gazette*. Even Farm Bureau's *Spokesman* ran informative articles on these issues, particularly in 1985 and 1986. *Wallace's Farmer* and *Successful Farming*, both based in Iowa, ran similar stories. *Wallace's Farmer* was one of the first publications to do extensive analysis of the new ag engineering projects being perfected by Dr. Jim Baker, such as a spoke-wheel nitrogen injector.

GROWING PAINS

The increasing funding for BSBDP allowed the participants to put into effect on an ever-widening scale new management techniques. But even with increased funds, there was a strain on the resources of the Clayton County Extension Office. Writing an assessment of his involvement with the project in March 1990, Jim Hosch pointed out that in 1989 there were 24 people employed by ISU Clayton Extension, and 14 of these people were working directly with BSBDP. At the very least, that meant completely reorganizing the office space to accommodate this small army of project personnel. "In dealing with this problem," Hosch wrote, "I feel strongly that the facility should not be a limiting factor in getting done what needs to be done."

Hosch pointed out that even when funding provides for salaries for these additional people, there is almost never funds for service supports. Other hidden expenses involve the need for Clayton County to keep up with an expanded program: more driving, more stationary and so on. On the positive side, the Clayton County staff has been far more involved with innovative education programs than is true of other Extension offices. They have also been host to state, national and even international dignitaries. On the down side, he writes, is the "political arena" in which environmental issues have been debated, where Big Spring is the focal point. For all of this, he concludes,

"Ten years ago when the BSBDP started I did not envision it to be like it is today. Locally we've strived to deal with the biases and barriers that could have hampered the project. We've not been as successful as we need to be in "letting go" of programs that aren't in stride with major program objectives. However, the project has tremendous support from local people and has helped us focus on a major issue."

Anything as significant as BSB DP is bound to draw criticism of a less constructive nature than that delivered by Jim Hosch. The National Agricultural Chemical Association (NACA) commissioned at least two evaluations of the water quality data to come from Big Spring. Much of the work was authored by Richard Fawcett, a former faculty member at Iowa State University, who was a participant in the Ad Hoc Karst Committee before leaving Iowa State University for consultant work. The NACA reports concluded that more research needed to be done at Big Spring, and that the actual results which had been achieved did not always support the conclusions of the researchers. In June 1989, a 12-member committee at Iowa State University also published a critique entitled "Big Spring Pesticide Monitoring Summary 1982-1988." The committee felt that there was not sufficient data to tell with certainty the origins of the pesticides which had been detected in Big Spring, whether these chemicals came from infiltration or surface water run-in.

"Misinterpretation of groundwater monitoring studies," the report concludes, "can result in misidentification of mechanisms or routes of contamination. It is our judgment that there are prevalent misconceptions about how groundwater contamination occurs in Iowa. These misconceptions threaten to hinder the development of effective practices to prevent contamination."

FINE TUNING

Monitoring at Big Spring has undergone refinement and expansion during the decade of its existence as a study area. As recently as 1989, GSB was adding deep nested wells which sample water to several hundred feet. By 1991, funding allowed for the monitoring of a total of 50 sites in the 103-square mile area, which now includes 1) shallow and deep wells to monitor chemical transport in and between aquifers; 2) farm wells and springs for additional data points in the Galena Aquifer; 3) tile lines that effectively monitor the top of the water table; 4) surface water; 5) rain that is analyzed for ions, nitrate, and pesticides.

Big Spring's researchers frequently admit that they do not fully understand the nature of agrichemicals and groundwater. Each year there will be peaks and valleys in the chart of chemicals emerging at Big Spring which cannot be explained by surface practices or meteorological events - so called in-phase and out-of-phase contributions to subsurface water. One possibility offered by Hallberg is that soils have sufficient stores of various chemicals that they may take years to clean out their reserves.

COMPOUNDERS TO RESEARCH

The 1980s were also perhaps the century's most challenging one in which to conduct 'real life' experiments such as that of Big Spring, and to expect consistent reliable data. You had, for instance:

- The Federal Payment In Kind (PIK) program of 1983, which took significant amounts of land out of production for a single year. There was also a drought this year which reduced yields.
- The 1985 farm bill, with its significant Conservation Reserve Program and Conservation Compliance Program.
- A severe upheaval in Iowa's farm community related to skyrocketing land values followed by a plunge in those values, coupled with high interest rates, high energy costs, mounting farm debts and widespread farm failures.
- A continued drought for two full planting years in 1988 and 1989, followed by above normal rainfall for parts of 1990 and 1991, including the spring planting seasons.
- Continued disincentives for farmers to extend their crop rotations.
- A dairy buyout program to reduce the nation's dairy herd, followed by the discontinuation of the milk price supports program, which most heavily hit small herds which do not use high tech or bioengineered products to stimulate milk production.

What tends to be forgotten is that practices were being altered as research/change was being implemented and monitoring went on. It would not have served the interests of farmers to treat Big Spring as if it were a research plot only, with nothing disturbed, in order that precise measures of pathways and methods of nonpoint source groundwater contamination be documented. Gerald Miller explains:

"There was the expectation that additional research was needed (after the first two water years had been collected at Big Spring). But what are you going to do? We took the mindset that while research was going on there needs to be something done. The surveys done by Roger Koster, Jim Hosch and Jim Kaap in 1984, and then the work of Steve Padgitt in 1986 said: 'Here are local attitudes and an inventory of what people are doing'. That gave us the key we needed. We felt we could go to the shelf and pull down what we know and work with farmers to implement changes."

CHAPTER 7: YA GOTTA WANNA

In any game, contest or even historical event, there have to be rules. In reflecting on what made the Karst Committee/Consortium work, George Hallberg and others from the groups have developed the "rules" which have made the Iowa program successful. The whole package is put under the title "Ya Gotta Wanna." (The phrase is borrowed from the track coach of Lyle Asell's son.) We tend to smile at such innocence. But it fit. Collectively, it's what you call an attitude.

In an address delivered in Washington DC, Hallberg identified critical factors in institutional attitudes which will aid a group in achieving extraordinary goals. These thoughts and others of the committee can be summarized:

YOU MUST PAY THE PRICE FOR COORDINATION.

Interagency coordination consumes time and energy. "Cooperation and coordination," Hallberg wrote, "is worth the effort; shared resources and expertise can get us further along than individual budgets or resources allow. The sum is typically much greater than its parts. In Iowa we have been able to initiate programs through collective actions that would not have been possible individually. Coordinated inter-agency plans or requirements are almost always received favorably in the political arena, partly because of their apparent efficiency, but partly because they occur so rarely. Some innovation is a side benefit of integration that will evolve out of coordination and cooperation - no particular institution has a lock on creativity.

"Paying the price for coordination will require deliberate decisions and support from administrators, because something will have to give! The time demands will require adjustments of staff assignments or changing responsibilities."

At the time the Karst Committee was shaping its most critical policy, all activity by the participants was volunteer work. Bernie Hoyer said that it consumed an entire year of his life to document and draft the appropriate policy statements and work to reach consensus among members.

Locally, Roger Koster and Jim Hosch found themselves more directly redefining themselves to carry out the goals of BSBDP. In his assessment of the experience, Hosch said of cooperative strength, *"while this is a strength, it is also a frustration at times. For example, it is tough to mesh all of the facets of the project together when so many people are involved."*

YOU MUST AGREE TO DISAGREE.

With the broad spectrum of nonpoint source issues, not everyone is going to agree on every definition or priority. But the basic consensus on program directions must be reached. Certain contentious issues may need to be left to the agency/personnel with the greatest expertise and responsibility in that area.

"What we were trying to work on was not necessarily something that shocked us," Jerry DeWitt explained. "Changes were taking place all around. So probably the right people who had the expertise observed and experienced change and had their eyes opened - the atmosphere was right for that."

One of the benefits of spending time identifying areas of responsibility and authority was that it broke down the usual kinds of barriers which agencies build that prevent them from truly listening to outside opinions. If someone were drawing a line, based on principal, then the argument could be taken back to the higher-level truth: we need to get something done, it is not presently being done, what can we do to move ahead?

"What I also learned from these people is that when you deal with a wide range of talented persons who seriously believe in what they are doing, then you must put differences aside out of respect for that person. Change may come, but you cannot destroy without also rebuilding."

YOU MUST PUT EGOS ASIDE, BOTH AGENCY AND PERSONAL EGOS.

"Whomever is in the lead of the currently noteworthy phase of a project will get the lead credits of the day, while some more deserving agency may not. It may even be necessary at times for a cooperator to take more credit than their due. This will happen, but it cannot be allowed to disrupt the team effort. Cooperators and administrators need to be sensitive to these issues, but also not to get too upset when they do not see credits. This can be a serious problem for individuals, as well. Some agencies/institutions may provide greater rewards to individuals for such efforts, while others give little recognition. It can be difficult to come up with the latest "bright idea" in a coordination meeting only to see it adopted and implemented by another group or agency. It takes some effort to keep a focus on the overall objectives."

"Trust was the key word," DeWitt added. "For example, George Hallberg. Even today when he speaks, he speaks for the betterment of Iowa. I know that he has personally gone to Washington to talk about the need to support Extension and why we need Extension in these kind of programs."

Not only did the Iowa group have persons who were willing to work behind the scenes, but they also acted like runners in a relay, carrying the baton at various stages of the project. Hoyer was the man to get the words down on paper, while Lindquist was one to make sure that the meetings moved ahead smoothly. Miller would be there when the demonstration farms glimmered as a reality, ready to cook up the right chemistry between researchers, field agents and local projects. The federal representatives who were based in Des Moines for SCS and ASCS were also quiet enablers who genuinely liked working on this project. "What was unique in Iowa," Lyle Asell said, "is that we do seem to work fairly well together. Maybe it is because we have such overwhelming problems that there is enough work to go around, so we don't get too concerned about someone wanting to take part of the pie. In fact, we will probably help put it on their plate if they want it.

"I think we are fairly homogenous. We tend to come from the same cultural and social type of backgrounds. We don't have the large urban-rural difficulties that some other parts of the world do. We are enough alike socially, and we're all well enough informed about agriculture that we don't get into some of the side issues that some of the other parts of the world do. A lot of people who worked on this project are no more than one generation removed from the farm themselves."

YOU HAVE TO SHARE.

The Committee also offered something of a safe haven for persons who were changing their thinking during this time of upheaval. One person said it was like a seminar. There was something new to be learned with

each presentation. Special speakers were a regular part of the meetings. Agency representatives also expanded themselves when they brought colleagues to these meetings who were perhaps doing more progressive things.

DO IT RIGHT.

Beyond general attitudes, there are some functional things which go into making a group action like this successful - even if 'Ya Gotta Wanna'. Hallberg has several:

- 1) Identify the right people to contribute.
- 2) Create a framework early which serves the needs of all participants, but is both specific and general, and has attractive attainable goals.
- 3) Allow implementation and solutions to occur as local programs, which can grow.
- 4) Agencies must communicate with each other and not make unilateral initiatives.
- 5) Identify cooperators for local programs.
- 6) Listen and learn, particularly from local programs and participants.
- 7) Market the information properly.

Identify the right stuff. In the case of the Karst Committee, that meant enlisting not only the help of agricultural engineers, but also agroeconomists. This added synergy to the group.

Create the right framework. "In Iowa," Hallberg said, "we found that a very important step from the inventory process was for the agencies to identify the resources that they could and would contribute to the program. We made it clear that this was not a game of "put 'n take:" the name of the game was PUT. If we could reach consensus on the needed direction, then we also wanted to identify what resources we would contribute, and/or what changes in direction we would contribute toward solutions. At that time of our beginning efforts, there were no resources available. Some of the contributions identified were efforts aimed at finding resources; staff assistance with grant proposals, or seeking special allocations from within an agency. While today there may be resources (such as 319 grants) to distribute to different agencies, for success and real involvement participants must also put in some resources. When institutions put in resources they become larger stakeholders, as well. The route to truly collaborative programs is paved with the pitfalls of personalities and politics among agencies and institutions. There is no patented formula for establishing successful cooperative institutional arrangements."

Agencies must communicate. The group must not bring embarrassment on its members. Everyone must know what the others are doing, and there needs to be public consensus in particulars. "One group can't stress that nitrates or pesticides in groundwater are a significant problem that requires attention, while another agency says these are non-issues and farmers should continue business as usual and simply worry about production. One agency can't be saying that soil conservation is the only concern when others are stressing that we must deal with chemical contamination of water as well."

Local level implementation - where the rubber meets the road. BSBDP has been both applauded and criticized because it chose a path early on of making sure that local farmers were supplied with potential solutions to their problems. Critics have noted that the Basin should have had a few years of uninfluenced data collection to establish baselines before moving in with BMPs and projects that altered practices. Defenders of the Basin point out that while science was not unduly sacrificed with the project as it did unfold, common sense suggests that the lowering of chemical inputs will save farmers money and almost certainly benefit the environment - therefore it is the direction that the group must go.

"The personalities of the people on the ground are certainly important," Asell said. "Perhaps more so than their technical qualifications. Roger Koster and Kay Connelly have tremendous credibility with the local

people, because they care and they are good listeners. You have to listen to the concerns of farmers out on the land."

The process needs to be dynamic, allowing for reform and regrouping. There needs to be awareness too that the target group may change its needs.

"As part of the process," Hallberg wrote, "the group can identify pertinent agency authorities and current activities pertinent to the problem and that potentially can affect progress positively or negatively. This inventory process can serve to open a dialogue, and also leads to identify the strengths and weaknesses of existing programs for addressing nonpoint source problems. What are the gaps in the current programs, gaps in authorities, new authorities or needed staff or fiscal resources, identify information and research needs. Try to develop a consolidated plan of recommendations that identify needs -- fiscal, staff or statutory - for all agencies involved. This can help to keep all the players involved. As noted, coordinated inter-agency plans are often received much better in the political arena, than single agency requests, as well."

Listen and learn. "Most of the same spirit and process, described above, will need to be repeated in establishing project level implementation at the local level," Hallberg wrote. "Here it is critical for the process to operate from the bottom up, as well as the top down. Bottom-up listening, program feedback and alterations are particularly crucial. You must listen to local people involved with implementation - we can't implement everything at once - so apply some common sense - as foreign as that can be to agency implementation sometimes. You must listen to your local contacts needs and desires.

"What do the local people perceive their problems are, their needs are? What are the local parties willing to do, what do they want to do? How do these fit into the identified program needs? Can the local needs and wants be met as a meaningful step in implementing the program? Durable solutions must involve grass roots commitment. Hence, if you can identify, and take advantage of local perceptions and willingness to act, if you can tailor stepwise implementation, local progress may come more readily."

Identify cooperators for local programs. "Implementation is as much a sociological and socio-economic process as a technical one. Some significant portion of the success attributed to Iowa's programs comes from this recognition. Some solutions may be acceptable, but local operators may not have the management skills or the equipment to implement them. Some practices may not even be perceived as problems by local operators. If these are the targets of initial programs they have little chance of success."

"The individual cooperators are incredibly willing to answer questions (in BSB DP)" said Kathie Bentley, information specialist. "We have gone out with a video crew, right during crop season, go to a cooperator and say: 'Can we come out in an hour? I am going to be bringing a camera man and another person taking notes. Can we talk?'

"These people are getting off of a tractor in the middle of a field, stopping, because we are flagging them down, and they are answering questions and knowing that they need to get so many more acres done that afternoon. And answering the questions. And thinking about it and saying - I am not probably the best persons to say this, but this is how I see it - and these are the changes that I have made in this field."

Information marketing. "We have found some important components for information marketing," Hallberg writes. "Three stages of information delivery may be needed: 1) to stimulate (catalyze) interest and recognition of the problem; 2) to provide contact with alternative practices, to identify that there are solutions, or at least appropriate steps in the right direction while we work towards solutions; and 3) to collaborate with farmers in the transition to, and the development of new practices. There are also critical qualities about information marketing. First, the information must be designed to match the needs, concerns, and issues relevant to the agency and farmers. These can be ascertained through sociological surveys. Second, the provider must have credibility with the audience to have much impact. Third, the manner in which the information is provided and its timeliness can be critical to effective use."

"You have to identify the right local people to recruit for the demonstrations," Miller added. "And to make that happen you have to have a paid cheerleader who you can move in there, to really capitalize on the media."

"One of the things we did as we were identifying people," Hallberg added, "is to involve the sociological inventories - to better define both what the people were doing, and who our audience was. What was our target market really doing? Because we had lost track of that. So we built in the sociological aspect on the front end - to market basic information on what we can do; as well as the other end, which is where we are, as an evaluation. I don't term our approach 'education' any more. I term it information marketing, because we compete with other agricultural components which have had over 20 years to market their ideas."

A WARNING!

Rapid growth of new programs can quickly outstrip the capability of the coordinators to stay in touch with the development of the program. In Iowa, there was a tendency to mark evolution of the demonstration programs by adding new demonstrations. Some of these programs supplanted older models, as educators zeroed in on integrated approaches which also better informed noncooperating farmers. Other demonstrations reflected new funds coming available through legislated programs, which required slightly different emphasis than older programs - while still replicating most of the same work. And Iowa also had its share of demonstrations created for the sake of participating agencies - as is true in other states. The net impact of all this is explored in the chapter on the evolution of the projects.

CHAPTER 8: THE 1987 IOWA GROUNDWATER PROTECTION ACT

BACKGROUND

In 1985 the Iowa legislature approved a mandate calling for a comprehensive groundwater strategy to be drafted by the then Iowa Department of Water, Air and Waste Management. The final plan was to be delivered to the General Assembly by January 1, 1987. In 1986 DWAWM was reorganized with other agencies, including the Iowa Geological Survey, into the Department of Natural Resources (IDNR). IDNR had the charge to author the original strategy, and Bernard Hoyer was assigned to complete the draft, which he did on behalf of the Environmental Protection Commission.

In 1986 several bills were introduced into the Iowa legislature which aimed at regulating significant sources of groundwater pollution, such as underground storage tanks and agrichemicals. These bills were picked off by opponents, who were supported by strong trade lobbyists. The pro-active Integrated Farm Management Demonstration Project, described in the previous chapter, was passed. It was able to utilize the newly available \$37 million oil overcharge fund. This precedence was important to Consortium members, who wanted to tap the overcharge for other programs, including BSB DP. Other important steps were taken in 1986 which eventually helped pass the 1987 Iowa Groundwater Protection Act. These included:

- A series of legislative town meetings held throughout the State in which legislators met local persons and heard their concerns regarding groundwater protection. From these meetings, major threats to groundwater were identified, which would be incorporated into the omnibus '87 bill.
- Continued evidence that the public, including farmers, were willing to pay for better protection of groundwater resources. The Iowa legislature conducted their own survey of Iowans and found a majority were in favor of a comprehensive strategy.
- Continued media coverage on groundwater problems and in particular problems with nonpoint source agrichemical contamination of groundwater. The coverage included several series of articles in the state's leading newspapers and at least one television series.

- Iowa's governor, Terry Branstad, made protection of the environment a major part of his re-election platform.
- Limited demonstrations in BSBDP, including the Bugenhagen sub-basin project, which showed that farmers could reduce inputs without sacrificing profits.

THE BATTLE BEGINS

The battle over the Groundwater Protection Act, introduced as House File 631 (HF 631) was waged through the entire four month legislative session, ending in the spring. Critical skirmishes and shrewd maneuvering went on at every juncture. Public meetings were held in the early phases of the process which involved special interest groups and proponents of the bill. Several agricultural groups were opposed to all or part of HF 631. Most of these organizations held their annual meetings in Des Moines during the legislative debates; and the debates at times moved from the capitol to the conference center with Consortium members providing much of the advocacy position.

Iowa was blessed with a group of legislators who had backgrounds in environmentally-related areas. They would be invaluable during the long process of amending and reamending which went on. In committees, 23 pages of amendments were offered. According to David Osterberg, a Representative from Mount Vernon, many of these amendments were hand-carried in by legislators for the opposition lobbyists. Some of that lobbying power had been hired by the National Agricultural Chemical Association (NACA), which was backing up IFCA with their expertise. In particular, there was a strong effort to weaken or remove altogether the nondegradation standard. But almost every aspect of the bill involving agriculture was contested, including the amounts of tax on agrichemicals, proposed dates for having abandoned wells plugged, and the program to shut down agricultural drainage wells. There was also language in the bill making pesticide applicators liable for their actions, when they could be identified as the polluter of groundwater supplies.

According to Osterberg, the House proponents were able to deflect almost all of the amendments. That was in part because the environmental House authors understood the language far better than the opponents, who were only acting in behalf of lobbyists who had to stay outside committee meetings. The real problem came when a marked up version was sent to the Senate side. Here there were almost no proponents who had environmental expertise. Quickly, major changes were made in most of the major sections of the bill. With less than four weeks to go in the legislative session, and a huge gulf existing between the House and Senate versions of HF 631, many supporters believed that the bill was finished. Then, during joint committee hearings behind closed doors, most of the original language was put back into HF 631.

Compromises were made. The so-called "Illinois language" was used as the nondegradation standard, which succinctly noted that no reasonable pollutant shall be allowed.

Also, Farm Bureau killed the pesticide applicator liability provision, which would have made applicators liable for cleanup costs if they were proven responsible.

The language dealing with abandoned well plugging and closure of agricultural drainage wells was retained. Also unveiled was creation of a center for sustainable agriculture. The signed bill called for \$64.5 million to be spent over a 5-year period on groundwater protection. This included \$17.5 million from the Oil Overcharge Fund, down from the original request for \$37 million. The balance of the revenue came from five new user fee accounts, such as the Agricultural Management Account, which taxed nitrogen fertilizers and pesticide retailers; an Underground Storage Tank account, and a Waste Management Account.

Opposition to the bill came from state and national organizations, including some very powerful lobbies. The environmentalists countered with a small group of mostly unpaid volunteers. Members of the Consortium also worked for passage of the bill, by participating in meetings and public discussions, and also by making sure that the Iowa media received information on why the bill was needed. But the bulk of the battle was shouldered by the half dozen legislators who sponsored the bill.

SIDEBAR: IOWA'S OMNIBUS GPA AT A GLANCE

HF 631 was a predominantly educational, nonregulatory approach to groundwater protection which put significant revenues into prevention and remediation. Twelve sources of potential groundwater contamination are addressed. These were prioritized into four categories, but subsequently all 12 have been acted upon with programs or follow-up legislation.

The GPA has six overall objectives, and 27 recommendations for actions. It also employs a rubric of process levels for addressing individual problem areas, which equate to those identified in the BSBDP master plan: research, education, legal sanctions and incentive programs. The Strategy is written for a 10-year period, with a \$230 million cost.

The six objectives of the Strategy are: 1) tougher regulations of landfills; 2) regulation requiring the plugging of abandoned wells; 3) permits for the drilling of new wells; 4) adoption of groundwater protection strategies by all counties; 5) the requirement of a permit for dumping on any land; and 6) regulation of minimum standards for all underground storage tanks.

The 12 sources of contamination, by priority, include:

Priority I

- Agricultural nitrogen and pesticides
- Abandoned hazardous waste sites and unauthorized disposal

Priority II

- Underground storage tanks and pipelines
- Landfills
- Storage, handling and transportation of hazardous substances

Priority III

- Agricultural drainage wells
- Abandoned wells
- Sinkholes

Priority IV

- Land application of solid and liquid wastes
- Lagoons and pits
- Septic systems
- Urban use of nitrogen and pesticides

In his draft to the Environmental Protection Commission, Hoyer noted in the Introduction that "The scope of the work is development of an appropriate coherent assemblage of policies and programs, derived from the best information currently available, to help protect Iowa's groundwater resource."

Prior to the EPC passing along the Strategy to the General Assembly, the Commission highlighted the importance of protecting Iowa's groundwater from agricultural contamination by adding three more objectives aimed at state agricultural policy:

1. The development of management techniques which are more efficient than those widely used today and which reduce nitrate and pesticide losses to the environment, especially to groundwater.
2. Widespread adoption of management practices which protect groundwater.
3. The development of information which can guide future groundwater policy concerning control of nonpoint, agricultural contamination of groundwater.

Fourteen of the 27 recommendations required action to be taken by the General Assembly, and 13 did not. In the latter category are program improvements which require additional funds or staff to implement. Also included here are recommendations which are more philosophical and abstract in scope, which suggest policy and provide the basis on which to develop programs. Included in this category was the recommendation of a nonregulatory approach to nondegradation of groundwater supplies.

As part of this suggested recommendation, the original Strategy noted that any contamination of groundwater is undesirable and may constitute additional risk to public health. The Strategy offered three policies to guide Iowa to a goal of nondegradation:

- 1) Prevent contamination.

- 2) Improve groundwater quality where contamination is present.
- 3) Enhance and maintain public confidence in groundwater quality through public awareness.

"A prevention orientation of policies and programs is a realization that society cannot successfully manage each and every activity," the Strategy explained. "Regulatory and nonregulatory policies should instead institute as much as possible, a framework for success which requires a minimal amount of day-to-day management. Perhaps more importantly, policies should encourage those activities which emphasize proper handling of potential contaminating materials. Monitoring and enforcement cannot be done everywhere. Specific rules for one activity may not apply to others. However, principles such as proper handling of all chemicals, their judicious use and reuse, and overall efficiency may apply in situations where personal decisions can prevent contamination. These personal decisions add up and are very important."

"The issue of setting standards or guidelines for groundwater is one that should be left for possible consideration if and when they are deemed desirable and necessary to enhance Iowa's groundwater protection efforts. Groundwater standards have been developed in other states as part of groundwater protection programs. Standards do not prevent contamination. They are not recommended at this time. The proposed initiatives in this strategy represent a very ambitious agenda. They are designed to protect our resources and provide public confidence. With an emphasis on groundwater protection programs focused on research and education for the immediate future, resources directed at establishing standards seem inappropriate.

"But groundwater standards must not be confused with drinking water standards. Drinking water standards represent the maximum amount of a contaminant allowable in drinking water. No one wants aquifers to be even close to such levels - and they need not be. Professionals do not trust such values and once an aquifer approaches such values it is very difficult, if not impossible, to go back.

"The Strategy believes future groundwater standards should be developed as numerical measures to guide actions, with investigations beginning when verified levels reach 10-20% of national numerical standards, such as MCL or an arbitrary value of one part per billion (PPB)."

Local governments are called upon in the Strategy to consider their role in the protection of groundwater, capitalizing on the present political support for these programs. Also, "other organizations such as soil and water conservation districts, water resource districts, drainage districts and county conservation boards should consider options in which they could participate."

In making this suggestion, the Strategy noted that in the past it has been local people who benefit most from programs to protect groundwater. In addition, any voluntary, nonregulatory program must have local support or nothing gets accomplished.

"The Strategy does not recommend any specific actions by local governments," it continued. "However, parts of many of the initiatives proposed can be adapted for local implementation and some were designed to help local governments. Elements especially pertinent to local entities include:

1. Declaration that drainage wells and abandoned wells are illegal.
2. Monitoring of public wells for problem assessment.
3. Challenge grant programs for private well water quality assessment.
4. Vulnerability mapping.
5. Landfill alternative planning grants.
6. Local governments hazardous waste collection and transportation systems.
7. Permanent conservation easements on watersheds draining to drainage wells and sinkholes.
8. Financial assistance programs for closing drainage wells and old abandoned wells, developing alternative drainage, protecting sinkhole watersheds and developing manure storage."

Another suggested recommendation called for an improvement in information about groundwater quality, obtained through better monitoring and a natural resource data base. This information should be passed along through use of the media, public service and environmental curriculum in public schools.

It was suggested that the state develop alternatives to landfills, with the long-term goal of reducing wastes to landfills by 75%. Another suggestion called for the creation of an underground storage tank program.

Recommendations requiring action by the General Assembly.

Among the recommendations for which the General Assembly must act were:

1. Drafting special groundwater legislation establishing groundwater as a resource in Iowa, that defines contamination, establishes nondegradation, and establishes individual and corporate responsibility and increased authority to protect groundwater.
2. Initiate a 10-year nonregulatory program to protect groundwater from agricultural fertilizers and pesticides.
3. Allow the Secretary of Agriculture to petition for pesticide restrictions where IDNR has evidence that these pesticides pose a significant health risk.

Also to:

- Develop a hazardous waste storage facility
- Create a statewide hazardous waste collection plan
- A program of conservation easements in sinkhole areas, or where agricultural drainage wells are to be closed; and methods to protect sinkholes from agricultural run-in.
- Plug abandoned rural wells and agricultural drainage wells
- A program for manure management and storage
- Expand Iowa's financial commitment to groundwater protection
- Use \$37 million from the Oil Overcharge Settlement Fund to support the strategy.

One of the most remarkable aspects of the Iowa Groundwater Protection Act is the degree to which it addressed the State's number one threat to groundwater - agriculture. Given the importance of agriculture to the Iowa economy and culture, the only way that the GPA could have been successful was in the manner utilized, which stressed nonregulatory assistance to farmers. This stance was acknowledged by IDNR Director Larry Wilson in remarks which he made before the U.S. House Committee on Agriculture when it convened in Iowa in the fall of 1987, to discuss groundwater issues.

"At the heart of this bill (HF 631)," Wilson explained, "is the belief that the prevention of groundwater contamination can exist in harmony with sustainable economic agricultural practices. Our state's challenge is to define practices that meet this goal, demonstrate them, and convince the agricultural community to implement them. The bill provides the tools to do this. If we are to succeed, a major portion of the executive branch's responsibility is to manage the effort of government and the private sector in a way that instills cooperation and confidence in the approach."

A great deal of the support of the kind described by Wilson is found in the demonstration programs, including BSBDP and IFMDP. But another very unique component was the Aldo Leopold Center for Sustainable Agriculture. This center, now located on the campus of Iowa State University, was primarily the creation of Paul Johnson, Decorah Representative. In naming it after the native Iowan Leopold, Johnson wanted to emphasize that man's special approach to farming.

Aldo Leopold is known as a conservationist and one of the architects of the U.S. Forest Service. He was also a farmer. As such, he brought to his own efforts the philosophy of the conservationist. He wrote in a series of essays, *Sand County Almanac*, on the special role of the farmer as a steward of the environment which surrounds him. Leopold believed that farmers needed to be true stewards of the land and nature, to nurture nature while reaping the harvest from that land.

SIDEBAR: MEDIA'S FINEST HOUR

The role of Iowa's media was critical to the passage of the 1987 Groundwater Protection Act. Throughout the legislative session there were daily stories documenting the progress or setbacks to the bill. Major participants were frequently quoted; and debates and dialogues were common on the pages of *The Des Moines Register* and *Cedar Rapids Gazette*.

Both papers endorsed the bill, and several other media also wrote endorsing editorials. The lack of resources on the side of the environmentalists gave a David versus Goliath tone to the telling of the capitol debates, with reports of the lobby fees paid by the opposition and election campaign fund contributions to key legislators.

There was also drama. When the bill appeared headed for a major weakening, the anger and frustration of legislative supporters of the bill was played up in articles. In fact, these emotional appeals delivered from the pages of our state newspapers may have done as much to influence the other members of the General Assembly than anything. Coupled with these appeals were editorials scolding legislators to do the honorable thing.

A Capsule Chronicle of Dispatches From the Front

January 1987

Iowa Farmer Today (IFT) "Groundwater Bill Setting Off Alarms." Early reaction to GPA, especially by Ted Yanecek of the Iowa Farm Bureau who said it was too broad, vague, costly and also punished farmers.

IFT, "Agrichemical Association Asks for New Regulations," IFCA calls for user tax on their industry for purposes of education, training and research instead of monitoring and standards.

Cedar Rapids Gazette (CRG) "Economic Interest Vs. Environment," Environmental Protection Committee (EPC) listened to testimony by Wynton Etchen of the Iowa Fertilizer and Chemical Association (IFCA) and environmental legislators. EPC also heard from Steve Padgitt, whose surveys suggested that farmers would accept higher taxes on chemicals.

Des Moines Register (DMR) editorial, by Donald Cell, Professor of Economics at Cornell College. "Six Fallacies About Water Clean-Up." Reviews what is supposed to happen by IDNR regulation, what actually does happen.

DMR, "Environmental Panel Takes Aim at Ending Groundwater Pollution," EPC unveils 130-page Strategy.

IFT, "Chemical Companies Respond to Public Concern," NACA study that shows widespread criticism of the use of pesticides by the public, most people will not accept any level of pesticides in drinking water, and they hold farmers responsible for groundwater contamination problems in Iowa.

IFT, "Iowa Northern Neighbor Also Beset by Groundwater Worries," reviews Minnesota 2-year study on well contamination.

IFT, "Farmer Liability With Ag Chemicals Before Congress," sums up proposed amendment of FIFRA to require farmers to be liable for groundwater contamination.

February

DMR, "Abandoned Wells Called Threat to Water," Iowa Water Well Association reports between 38,000 and 42,000 abandoned wells in Iowa, all potential problems.

DMR, "Groundwater Bill a Strong Lobby Issue," views of various lobbyists pro and con on the upcoming fight.

(6th of February) DMR, "\$10.9 Million Groundwater Tax Proposed," original unveiling of bi-partisan plan, including main features.

(22nd) DMR, "Nation Eyes Groundwater Fight in Iowa," points out rising national attention to Iowa legislation.

(27th) DMR, Editorial, "Battle Over Clean Water," points out the opposition to taxes, Farm Bureau involvement, cost to people for doing it.

March

- (12th) *DMR*, "Rivals Clash Over Groundwater Protection," at EPC hearings, various presenters give differing opinions pro and con.
- (19th) *DMR*, "Groundwater Purity Bill Approved by House Group," passes House Energy and Environmental Protection Commission 19-3 with full features retained.
- (25th) *DMR*, "Groundwater Protection Act Gains Support," clears House Ways and Means Committee, funded for \$10 million of original \$12.5 million; defeated floor amendment which would have stripped new taxes and fees and relied only on oil overcharge funds.
- (25th) *DMR*, "Paul Johnson, Not Your Typical Iowa Politician," a profile of Paul Johnson, House member from Decorah and a co-sponsor of HF 631 on his background, which includes graduate study in natural resources management and operating a sustainable organic dairy and Christmas tree farm.
- (29th) *DMR*, "Farmers Toxic Chemical Training Called 'A Farce'" reviews Iowa's pesticide certification program, and suggests reforms.

April

- (1st) *DMR*, "Chemical Dealers lobby Against Groundwater Bill," arrival in Des Moines of hundreds of chemical dealers to protest GPA - they object to what they say is no data yet to warrant this bill, and that there are no standards included in the bill.
- (3rd) *DMR*, "House Nears Compromise on Groundwater," describes fights within the House over various features of the bill, including cutting back \$1.1 million from the original, the elimination of one percent tax on pesticides and other taxes, the elimination of the ag drainage well deadline for closures, and resistance to other amendments.
- (5th) *CRG*, unsigned editorial, "Don't Cave In," shame on the lobbyists who are forcing changes in the original bill.
- (6th) *DMR*, editorial by staff writer David Yepsen. "How Will Monsanto's Gifts Affect Fate of Iowa Water-Cleanup Bill?" Gives amounts of contributions by Monsanto to legislators, Governor and others.
- (8th) *DMR*, "Complaint on Ethics Planned," Legislators go after Wynton Etchen of IFCA for sending a misleading letter to his members regarding the GPA.
- (9th) *DMR*, "Senate Begins Scrutiny of Groundwater Bill," bill passes Senate, but the Senate Committee does not like it much, and there are predictions of its weakening. It is reviewed by three committees, with opposition to the household fee language, and the new Legislative Fiscal Bureau reports that the estimates on how much revenues can be raised through the user fees are higher than their estimates.
- (10th) *DMR*, "Lobbyists Letter Riles Lawmakers," deals with the continued fight with Wynton Etchen.
- (11th) *Iowa Farm Bureau Spokesman (IFBS)*, "Groundwater Bill Provides Liability Protection to Farmers. Restates Goal," House makes a change in the GPA and it passes 81-16. Goes to the Senate.
- (14th) *DMR*, "Advocates Eye Senate Action on Groundwater," worried about Senate weakening of the bill. Senate leader vows that he will do his best, predicts critical amending will be done in Committee.
- (20th) *DMR*, editorial, David Yepsen. "No Real Groundwater Protection Likely Till '93 Reapportionment," Notes that critics of GPA can get away with their attitudes because of the way farm districts are laid out.
- (22nd) *DMR*, "Lobbyist Asks: Drop Complaint." Wynton Etchen goes before the Ethics Panel and pleads his case that he was entirely truthful in the statements he made before about the GPA to his membership.
- (24th) *DMR*, "Complaint Against Lobbyist Dropped." The Ethics Panel voted 5-0 to censure Etchen, but not to reprimand him.
- (24th) *DMR*, "Groundwater Debate Splinters Iowa Senate," Iowa Senate Democrats are in fight among themselves over the GPA. There are big differences in the House and Senate versions.
- (27th) *CRG*, "Study Public Water Supplies Contaminated By Chemicals," gives test results for 240 tap water supplies which turns up pesticides or SOCs in all but 77 of them, according to the State Hygienic Lab.
- (28th) *DMR*, unsigned editorial. "Phony Groundwater Bill," chastises the Senate for cutting the budget for the GPA.
- (29th) *DMR*, "Committee Will Try to Mesh Bills on Water Quality," this article analyzes the different versions point by point on such things as standards, the Leopold Center (for sustainable agriculture), and funding.

May

- (1st) *DMR*, editorial-letter, "Polluting Our Waters," contains several letters to the editor in favor of the bill.
- (1st) *DMR*, "Key Water Bill Backer Assails Senate Version," Osterberg says he is burned out, threatens to abandon bill because of fight over standards.
- (1st) *CRG*, "Compromise Possible on Groundwater Bill."
- (1st) *CRG*, "Foes of Water Cleanup Bill Gain Ground," supporters forced to retreat on key portions, but compromise is near.
- (4th) *DMR*, editorial. "Did Legislature Drop Water-Bill Bucket Because Too Many Are Going to the Well?" discusses how authors are disillusioned, environmental interests are radicalized by the vested lobby interests.
- (8th) *DMR*, "Water Bill Nears Passage as 600,000 Fish Poisoned," the Conference Committee reaches a resolution, looks like most of the House language has been put back into the bill. A related article deals with a fish kill at Rathbun Water Reservoir where agricultural chemicals are suspected to be the cause.
- (9th) *DMR*, "House Passes \$12 Million Water Protection Bill," House has 85-10 vote for the amended bill and returns it to the Senate.
- (11th) *DMR*, "Water Bill Labeled Good, Not Great," sums up the final version which is sent to the Governor for signature. Lists the provisions in the bill.
- (14th) *DMR*, unsigned editorial. "Water-Rate Protection Victory," this editorial notes several potential fatal flaws in the passed bill, which could cause problems down the road. Notes that the GPA is just the beginning.

Accordingly, the work done at the Leopold Center is meant to be profitable to farmers, but also to be harmless to the environment, or preferably to enhance it. Johnson wanted to make sure that there was a de-emphasis of production, and more emphasis on profitability in the perfection of new farming techniques at the center. To this end, he originally opposed placing the center at Iowa State, where he felt there would be a possibility of undue influence by so-called conventional agricultural research.

An understanding was eventually reached between Johnson and other environmental legislators, and advocates who wanted to see the center placed at Iowa State. Today, the Leopold Center conducts both basic and applied research on sustainable agricultural systems. It uses a series of inter-disciplinary investigative teams to bring creative solutions to such general problem areas as land management, conservation and human resources. The Leopold Center has an annual budget of approximately \$600,000 to give in competitive grants. Many of these projects go to people outside ISU or the formal agricultural research network, including farmers who put forth solid research ideas. The description of the Center as contained in HF 631 reads in part:

"The Center shall conduct and sponsor research to identify and reduce negative environmental and socio-economic impacts of agricultural practices. The Center also shall research and assist in developing emerging alternative practices that are consistent with a sustainable agriculture. The Center shall develop in association with the Iowa Cooperative Extension Service in agriculture and home economics an educational framework to inform the agricultural community and the general public of its findings."

How were sponsors able to pull off such a comprehensive groundwater protection act? Bernie Hoyer reflected on the drafting of the Strategy. He believes that the work which preceded the legislation, done by the Ad Hoc Committee and then the Consortium, set the stage for acceptance of the document. "We had already done the talking," he explains. "We had already done the planning. Sure, it was repackaged. But the same

people who had to reach consensus before is what the groundwater initiative is all about. In the meetings we were trying to be *reasonable*. That is what the strategy is - reasonable: education, demonstrations.

"Without that previous experience, there would have been no way in the world the strategy would have come out anywhere close to the direction that it did. It would have been much more policy-oriented, goal-oriented. It probably would have sounded more like California, but they wouldn't have put in any money to implement it.

"When I was writing the Strategy, we just redid the discussions we had with a different group of people. Some were new to the issue, and they were certainly new to these kind of ideas. And some were antagonistic towards them. But in the end they went along with it because it is reasonable -- and that is the way Iowans are."

SECTION IV: EVOLUTION.

Time-Line

1988

Legislative adjustments to GPA, which included exemption of children who apply pesticides on soybean fields from needing applicator certification; extension of well-plugging deadlines by a year for abandoned wells.

Cooperating agencies adjust to major new efforts of GPA.

Water Conservation District special projects.

February. Tomas Klaseus of the Minnesota Department of Health publishes the results of 500 sampled rural wells in southern Minnesota, as "Pesticides and Groundwater: Surveys of Selected Minnesota Wells."

March 24th. The Practical Farmers of Iowa hold their first conference at Postville, under the title "Farming Over Threatened Groundwater."

Legislature develops Water Quality Protection Fund to support Soil and Water Conservation District special projects.

June. Environmental coalition White Paper published, "Protecting the Nation's Groundwater: A Proposal for Federal Legislation," 115 pages, including contributions by Izaak Walton League, NRDC and others.

September 24. Four demonstration projects adapted to agricultural drainage wells are announced.

November. IGS drilling test wells in locations around BSB to further study aquifers.

November, 64,000 pounds of waste is netted in cleanup days at three toxic cleanup sites around Iowa, to test feasibility of widescale utilization.

1989

Legislation creates the Resource Enhancement and Protection Program (REAP) in Iowa.

Adjustments to Iowa GPA include legislative debates over funding for underground storage tank cleanup program; debate over buffer strips along waterways; proposal for an environmental advocate in Iowa; proposal for extensive monitoring of air and water quality; debate over adoption of EPA standards for health advisories/MCLs; and special taxes on pesticides. New initiatives included proposed disclosure of inert ingredients; proposed use of lottery profits for environmental projects.

Legislation authorized Model Farm Demonstration Project, which established 5 'Big Spring' styled farm management demonstration areas around the state.

Local demonstrations in the Basin.

Steve Padgitt releases study of 593 farmers, showing drinking water contamination is a main concern. Poll by Iowa Natural Heritage Foundation shows that sinkholes are also considered a threat to groundwater by a majority of Iowans.

Another ISU study shows that state soil commissioners believe water issues are replacing concern over soil erosion among farmers.

June. BSB DP Tour, by Extension and Federal agency officials.

July. Water Quality Program Plan, to support President's Water Quality Initiative, USDA and cooperating state agencies, USGS, Nonpoint Source Solutions, an 8-year project.

September. A 5-year project is launched in Pochahontas County to protect ag drainage wells from ruin.

October. U of I Preventive Medicine scientist Peter Isacson releases findings that underweight rural babies may be linked to contamination of drinking water, especially from high levels of nitrate and possibly atrazine.

October. Legislature decides that environmental projects will get lottery funds after sunset of Economic Development Program for lottery profits.

December. The 10-member Pesticide Advisory Committee recommends that the state restrict the use of atrazine, following significant and widespread detections of pesticide in groundwater. Also, IDALS and the Secretary of Agriculture adopts atrazine restrictions for sinkholes and agricultural drainage well areas.

December. Alfred Blackmer's Late Spring Nitrogen Test kit is unveiled.

1990

EPA urges Iowa to comply with new CWA requirements for surface water pollution standards, which may cost small towns \$600 million in water treatment systems.

Congressman Fred Grandy (Iowa) authors legislation to create groundwater office within USDA to coordinate all agency activities.

Various studies and reports during the year which are critical of alternative agriculture, the ability of farmers to lower chemical inputs and deliver good, inexpensive food. Pressure is there to re-emphasize soil erosion as farming's greatest problem.

Unsuccessful legislative attempt to ban atrazine in some areas of the state.

University of Iowa receives four grants for farm health, including pesticide and farm safety.

January. Release findings of high nitrate in surface water of 10 Midwestern states, less so with pesticides. USGS study.

February. Results of Butler County Project show a savings of \$500,000 for participating farms, through Integrated Crop Management (ICM) Initiative.

April. Iowa has three sites in USDA's new MSEA Program to evaluate groundwater quality and farming practices, at Nashua, ISU campus and Pottawattamie County, with a grant of \$1.25 million from ARS.

May, Office of Technology Assessment releases, "Beneath the Bottom Line," which looks at farm practices and groundwater contamination.

May. Federal Integrated Crop Management introduced by ASCS, new cost-sharing plan, based on Iowa's ICM approach.

May. Iowa Northeast Iowa River Basin Demonstration Project begun in four counties.

May. ISU introduces "On-Farm Management Services."

August. Monsanto releases 2-year study of 1,439 wells in 26 states, showing 87% are free of detectable levels of five herbicides and one percent exceed EPA standards.

- August. National Sustainable Agriculture and Natural Resources conference, bringing together farmers and environmentalists.
- September. USDA shuns Senator Tom Harkin (Iowa) water plan.
- October. Iowa Environmental Protection Commission debates easing health advisory standards for groundwater cleanup which were adopted in 1989, postpones action following considerable criticism of this step.
- November. California's "Big Green" proposed legislation, which would put more pressure on manufacturers to prove their products are not cancer-causing, is defeated.
- December. Wilson Scaling of Soil USDA Conservation Service announces that Iowa will do a pilot project on grazing of CRP lands.
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Overview

With full funding, participants in the Consortium faced the challenge of implementation. The formal and informal planning discussions obviously decreased in their numbers. In their place were other forms of dialogue that involved specific education or demonstration projects. Legislatively, the 1987 Groundwater Protection Act called for further drafting of bills to spell out programs which had been enabled by the original legislation. Some of these programs were as innovative as the original HF 631. In a few instances, subsequent generations of bills acted to postpone or otherwise compromise the original provisions.

It was challenging to apply a nonregulatory, education-based scheme to all 12 contamination areas identified in HF 631. That would have been true at any time in recent history, but in the 1980s it was particularly hard in Iowa, which experienced a recession when many other parts of the country were still relatively prosperous.

What has kept Iowa's groundwater strategy viable is the strength of the original vision; the ease with which new people and innovative thoughts have been incorporated into the groundwater arena; and the continued cooperation by the people and organizations who were originally involved in planning the strategy. The downside to the evolution of Iowa's programs is that there has been inevitable dilution of purpose as more and more persons and projects became involved.

CHAPTER 9. CONSORTIUM PARTICIPANTS GET SERIOUS

The first large-scale step towards fulfillment of Iowa's groundwater strategy came in 1986 with the creation of the Integrated Farm Management Demonstration Project (IFMDP). The Agricultural-Energy Management Fund was created at that time to accept Oil Overcharge Funds with an advisory board to oversee the development of the IFMDP. It was largely the Consortium revisited. (Five other special funds were created by the GPA, that encompassed the 12 contaminant areas addressed in HF 631. These funds provide a dedicated source of revenues coming from user fees, registration fees, and taxes on things ranging from underground storage tanks to manufacturers of agrichemicals. A separate Agricultural Management Account was established that accrued the fees from agrichemicals and fertilizers; none of these funds went to the IFMDP or BSBDP, however. These funds are used to support the Leopold Center, the Center for Health Effects of Environmental Contaminants, and other programs.)

Under the IFMDP, Iowa State University had two primary initiatives, which were carried out by the Iowa Agricultural Experiment Station and Iowa Cooperative Extension Service. The Agricultural Experiment Station developed a broad range of study areas which involved farm practices and water quality, which they perfected in traditional replicated practices with multiple treatments to assess their impacts on groundwater quality. For example, much of the testing of subsurface migration of agrichemicals to groundwater was now channeled through this program division.

CES has been concerned with delivering BMPs to farmers, as well as other strategies which they can use. It is also perfecting the educational model(s) so they better affect change among farmers. The criteria for IFM models is that they be holistic in management, integrate available information - much of it familiar to farmers; and better sort out strategies which in the past have proven to be counterproductive when put together. The final model should also benefit the Three Es: *Environment, Economics and Energy*. In many instances, CES is employing strategies which are also being studied by the Agricultural Experiment Station, and mixed projects may occupy the same farm sites.

In the cover letter which Hallberg wrote to Jim Gulliford for the draft plan of IFMDP, which the latter had requested, Hallberg drew attention to how the new program departs from the traditional:

"Demonstration projects, simply for the sake of numbers, will not likely accelerate adoption. There are already demonstration plots in every county in Iowa, literally hundreds statewide, when considering the myriad of projects sponsored by the collective programs of Soil and Water Conservation Districts, Iowa Division of Soil Conservation-Soil Conservation Service-ISU Extension, FFA, and 4-H groups, conservation boards, local "tillage clubs," groups such as Practical Farmers of Iowa, Resourceful Farming, and agribusiness. While important, *without adequate, reliable documentation on the "risks and benefits," these demonstrations are not likely to accelerate adoption.*"

Integration at all levels was the key, creating a very complex but thorough network of research/demonstration projects which have expanded their individual potential over time. For example, research programs for single components, are integrated into a variety of settings. This allows the sides to be more holistic, while providing a variety of conditions which give a better measure of how to make the single component work effectively in real situations.

The Experiment Station's IFMDP initiative had four principal objectives: 1) demonstration of the efficiencies of integrated tillage and N fertilization practices for reducing energy and chemical inputs in cropping systems; 2) demonstration of the economic and environmental benefits of nutrient management through crop cultural practices; 3) demonstration of water quality, energy, and production efficiency benefits from improved agricultural chemical management; and 4) demonstration of water (subirrigation) and nutrient management systems to improve nitrogen use efficiency and reduce environmental impacts.

CES had five goals it wished to accomplish with its integrated educational program: 1) an increased understanding about groundwater quality issues, the condition of groundwater supplies, and the causes of non-point source contamination; 2) identification of ways to reduce chemical, nutrient and sediment contamination, while encouraging efficiency; 3) demonstration of practices that increase efficiency of total energy inputs; 4) demonstration of best management practices; and 5) an understanding of the effects of best management practices on groundwater quality, farming efficiency, energy conservation and farming profitability.

Where both the experiment station and CES have projects at the same site, they often still look at the same data from differing perspectives. The objective is to assess the performance and validity of practices, while also looking at the practicality and adaptation of those practices.

Among the projects of the Agricultural Research Station are the following:

- + On-farm demonstrations of alternative tillage systems for energy conservation;
- + Different tillage systems on energy conservation (replication of crops with three tillage practices);
- + Various fertilizer nitrogen (FN) strategies, including increased nitrogen efficiency on ridge till; FN rates and corn yields relative to nitrogen losses to soils; optimal time of FN application to improve use and reduce leaching.
- + Animal manure management; strip intercropping; placement of FN for optimal root growth, corn hybrid response to nitrogen management; improved weed management for improved energy and reduced water contamination.

CES has had at least half a dozen integrated projects, which include:

Integrated Crop Management Project, which has as its objective the use of Integrated Nutrient and Integrated Pest Management plans and better crop enterprise records to achieve realistic yield goals that increase profitability; and to prove in-depth crop management advisory services could be profitable while reducing inputs.

Integrated Nutrient Management, which more efficiently takes into account crop rotations, manure use, soil and soil capability when applying FN.

Farm 2000 Project, designed to be a regional model program introducing more sustainable production practices to farmers. It worked with a small number of farmers using a coordinator who brought the farmers together to discuss the use of holistic, sustainable techniques. A project coordinator works with a core group of farmers in a four-county area in East Central Iowa.

Practical Farmers of Iowa. This is a non-profit educational organization of farmers which pre-existed the 1987 GPA. Farmers employ sustainable techniques in replicated plot studies on their farms to measure their relative success. Since 1988 CES has provided an agent who works with PFI cooperators and coordinates their studies.

Crop Production and Protection Extension Education Programs for Agribusiness. These are short courses which introduce agribusinesses to such things as field scouting, reduction of chemical inputs, alternative tillage practices and integrated crop management.

The On-Farm Management Services Project implements improved animal manure management technologies on farms to reduce the use of nitrogen fertilizer.

The above list does not nearly exhaust the extent of IFMDP. The Leopold Center has also conducted projects with IFMDP. In 1990, for example, it compiled a demographic portrait of conventional farmers which were contrasted to sustainable farmers, that illuminates personality traits which would dispose farmers to one style or the other. That study was done as an inter-disciplinary group which brought together expertise from both within ISU but also other institutions from around the state.

ATTITUDE CHANGE

An important provision of IFMDP was the evaluation/feedback component written into the original program. Assessments of the implementation and perfection of BMPs and BATs was conducted by Dr. Cheryl Contant, Associate Professor, Graduate Program in Urban and Regional Planning and the Public Policy Center at the University of Iowa. Her data shows that the first crop year, 1987, was a shaky one in terms of the smoothness of implementation and adoption. Funding had come suddenly, and there was little time to enlist field scouts or to recruit the right farmers. At the end of that year, Contant evaluated the effectiveness of information dissemination in the '87 IFMDP. The goal of her report was to focus on three issues: 1) Monitoring the activities and information dissemination efforts of the demonstrators; 2) identifying modifications in the Project's efforts that seek to improve existing demonstration and information dissemination efforts, and 3) providing recommendations for new approaches for alternative demonstration and information dissemination efforts.

Contant's work, published in 1988, covered 300 field demonstrations mounted in the 1987 growing season. Of the demonstrators surveyed, 61% reported improvements in their farm management skills. Their interactions with private crop consultants in the Iowa Natural Heritage Foundation's component of IFMDP were viewed with mixed reactions. Fifty-three percent of the demonstrators viewed their interactions with consultants as beneficial in providing for more efficient use of chemicals on their fields. Twenty percent said consultants had recommended more agrichemicals than they had intended; and only 31% actually did reduce their use of farm chemicals. It was clear to persons administering the IFMDP program that more care needed to be taken in recruiting the consultants, including making them aware of the goals of the program.

LIMITED COMMUNICATION

Contant also found that there needed to be better ways to get information to area farmers, and to utilize the demonstrations more effectively with neighboring farmers. When she looked closely at the Resourceful Farming component project, for example, she found that only seven of 39 nondemonstrator respondents knew of the existence of a project in their area. In general, Contant found there were differences between programs. Where nondemonstrators did know of the existence of demonstrations, county extension agents were most likely to have helped in making the contacts.

Contant found that 71% of those farmers who knew about a demonstration in their area were cautiously optimistic that they would consider the demonstration's approach in their own practices, but they wanted more facts and results. But influences quickly faded when Contant considered larger clusters of farmers at the community level around a demonstration. There was little direct impact by the demonstrations.

IMPACT OF FIELD DEMONSTRATIONS

"In general, field demonstrations were cited as useful sources of information in only about one-third of the farm management decisions investigated," she reported. "Decisions regarding seed variety choice, tillage practices, and herbicide application were influenced by field demonstration projects, but farmers indicated that their own past experience or local sales dealers recommendations were much more influential and more preferred sources of information."

"These results appear to be quite discouraging for the use of field demonstrations to influence farming practices," she adds. "Not only are field demonstrations not used often as sources of information for crop production operations, but they are viewed as providing only somewhat reliable information. The relative lack of usefulness may be a direct result of the lack of widespread and readily accessible demonstration projects throughout the state. It may also be the result of the lack of structured efforts to accumulate and disseminate the results of field demonstration projects to farmers around the state. However, as more demonstrations funded through the IFMDP and more rigorous information dissemination efforts are included in the Project's design, farmers perceptions of demonstrations may improve over time."

"Additionally, many demonstrations in the past are perceived to have lacked the scientific rigor that promotes reliable and valid information. If demonstrations are designed in the future to provide more scientifically valid information, the reliability of these sources of information may increase the usefulness of this information on individual farms. These results, however, must be monitored to measure changes which occur over time."

CONTANT'S RECOMMENDATIONS

- + Encourage farmers to participate in field demonstration efforts to discuss their farming practices with other farmers in a variety of formal and informal ways.
- + Promote the inclusion of a wide variety of demonstration techniques and farmers throughout the state in future field demonstration programs.
- + Provide advice and expertise to demonstrator farmers on proper designs for field demonstrations to allow scientifically-based comparisons and recommendations to be made.
- + Promote the use of professional staff to collect and analyze demonstration field test results.
- + Use a variety of approaches to disseminate valid and reliable information to farmers from the demonstration projects.
- + Provide mechanisms to ensure quality control over dissemination efforts through the use of training and/or certification programs for information dissemination groups or individuals.

"In sum, the IFMDP efforts in the future should undertake a multi-faceted effort to ensure the widespread acceptance of demonstration efforts by the variety of farmers included in the State of Iowa. Targeting demonstration approaches to particular farming sectors appears to provide an efficient match between the need for information from some farmers and the provision of that information. With these changes and appropriate controls over the quality of the field demonstrations and educational components, the project should be headed in a direction where demonstration projects may yield significant advances in agronomic practices and improve the energy and environmental effects of farming activities in Iowa."

SIDEBAR: ATTITUDE PROGRESS REPORT

In May 1990, Dr. Contant did her follow-up on IFMDP, to assess what effect the program had after two additional years of operation. In particular, she was looking at how farmers process information, what influences them to change, and how farmers who do change can be better used to speed up the conversion process with those around them. This particular assessment included some farmers in the BSBDP, but it did not include the so-called Model Farms Program (discussed later), which was begun with crop year 1990.

She found that 64% of demonstrating cooperative farmers had decreased the amount of nitrogen they applied, but 76% of their neighbors (solicited at a ratio of 10 nondemonstrators to one demonstrator) had not changed their nitrogen plan over the past three years. Forty-eight percent of cooperators and 54% of neighbors said the goal of groundwater policy should be to prevent further contamination, and 93% of all respondents indicated that they would like to reduce chemical use.

"Information obtained from the in-depth farm operator interviews," Contant continued, "provided substantial insights into several issues left unanswered from previous surveys. For example, data collected from farmers indicates that participation in federal farm programs and other similar financial or operational constraints (such as equipment, etc.) may be preventing farmers from carrying out desires to reduce their farm chemical usage. To be

Sidebar continued;

most effective, therefore, programs designed to influence farm chemical use must recognize these constraints on a farmer's ability to adapt to changing chemical use requirements.

"In addition, data obtained from the interviews and earlier surveys help us understand farmers' needs for information and its most effective forms. These analyses suggest that the process of providing information to farmers occurs in three stages. *First*, information is provided to farmers to stimulate their interest in the existence of groundwater problems resulting from excessive or inefficient agricultural chemical usage. Sources of such information could be farm publications or local extension agents who can present this information in a scientific, understandable and relevant manner.

"*Second*, after recognizing the existence of the problem, farmers must have contact with new farming practices that are viewed as solutions to the problem. This information suggests that solutions exist for the particular farmer's operations and that they are workable. Sources of such information include neighbors, field demonstrations, or friends. Key factors in disseminating this information appear to be the history of use over time and the existence of some personal or social contact that make the source trusted, applied, and applicable to a particular farm operator.

"*Third*, after providing motivation to change and contact with solutions, information providers must work collaboratively and cooperatively with the farmer in the adoption of the new practice. This final stage of communication suggests that direct assistance to the farmer may be necessary to aid in adjusting solutions to work effectively on the highly variable farms throughout the state. This notion of collaboration also provides a sense of "buying in" to the uncertainty and risk associated with adopting a new management practice. Local extension agents, dealers, crop consultants, or managers would be effective providers of this information because they are knowledgeable, have a history of previous use by farmers, and have provided program information in the past.

"*This three-stage process of providing information to farmers has implications for IFMDP. To be most effective, efforts should target certain messages to particular farmers through the most useful sources possible. For example, for the most part, field demonstrations could be used to provide contact with potential solutions to farm management problems. Dealers, consultants, and extension agents could then be used to work with farmers to help in the actual adoption of new management practices. This approach allows useful information to be disseminated through the most effective and influential sources possible.*"

Contant generated several recommendations for IFMDP in the future:

- + IFMDP needs to continue communicating with farmers throughout the state on agricultural chemical use, farm management approaches and groundwater contamination problems.
- + IFMDP needs to continue to provide farmer contact with new practices and management approaches through field days, tours, demonstrations and use of crop consultant services.
- + Involve farmers who are active participants in federal farm programs, to show physical and economic evidence of the effects of reduced farm chemicals within the constraints of these programs.
- + Develop direct assistance to farmers to make the transition to new management or farming practices.
- + Expand communication to additional farmers.

EARLY SUCCESS IN BUTLER COUNTY

Beginning with 1988, the success of the IFMDP concept began to show. The Integrated Crop Management (ICM) Project and BSBDP were able to show significant economic savings by reducing chemical inputs without sacrificing yields. The most successful project was the Butler County Project. It was brought in under IFMDP in November of 1987 for the 1988 crop year. The three-year, relatively inexpensive program

was a phased cost-share arrangement in which farmers eventually paid for all of the consulting fees. Butler County had these goals:

- 1) Demonstrate that farm profitability can be improved through use of enterprise records and ICM procedures;
- 2) Demonstrate that complete planning and access to accurate field data throughout the cropping season will facilitate prudent and effective practices in farmers' use of fertilizers and pesticides;
- 3) Provide a framework for the orderly transfer of the project from the public to the private sector over a three-year period; and
- 4) Move the project from the single model county to seed counties in other Iowa Extension areas.

In its first year, Butler County was funded entirely by the IFMDP. Approximately 50 farms, in five clusters within the county, were provided with free scouting and advising service. The farms totaled 22,000 acres, with financing costs at about \$4.50 an acre. In 1989, farmers were asked to pay \$1.50 as their support for the consulting services. Five of the farmers from the first year dropped out, but three new farmers came on board, and the total acreage remained virtually unchanged. In 1990, the last year of the supported study, farmers were asked to pay \$3.00 per acre for consultation. That year, 38 farms stayed in the project, which also included eight additions and 18 dropouts, with a final acreage of 17,000. In 1991, when the project became private, those same numbers of farmers and acres were involved, with the cost to farmers of about \$4.50 per acre. The ICM program has been able to continue operating as its own private business.

In 1989 and 1990, participating farmers improved their net profitability by \$500,000 each year, primarily through reduction of agrichemical inputs, but also from other strategies identified by the professional scouts. The personnel used included a coordinator, two scouts who worked for eight months of the year and three additional scouts who worked four months in the summer.

SAVINGS

Over the three years, various farmers who took their advice realized such benefits as:

- A timely spider mite control treatment in soybeans cut one farmer's yield losses and improved his net income by \$13,440, and still avoided a blanket application of pesticides to all soybeans.
- Two farmers sufficiently reduced phosphorus and potassium fertilizer after soil testing to save \$21,000.
- By seeding 60 acres of oats and alfalfa on a field with a more desirable pH, a farmer did not have to reseed alfalfa, and saved one year's alfalfa yield - a \$15,000 benefit.
- In 1990, for every dollar farmers spent on consulting, on average they earned a five dollar return.

NOVEL RECRUITMENT

Perhaps the most interesting aspect to the Butler County Project was the manner in which participants were recruited. Kay Connelly, who is now state coordinator of the Model Farms project, was Butler's coordinator. In the winter of 1987-1988, he worked closely with local extension agents to identify farmers who they felt would be most effective in doing further recruitment of farmers in their area for the project. It was essential that these initially recruited farmers be respected leaders in the eyes of other area farmers. Each of these farmers would then become the core around which a cluster of other farmers could be gathered.

Connelly and his county agents next approached the farmers they had identified and asked if they wished to participate in the program. They explained to them that part of their responsibility would be to recruit the right neighbors for the program.

"In every case the individual said yes," Connelly said. "We asked them to help us with the list. We did not want someone invited who everyone else in the group would not want to be there. We also did not want to miss

someone. Then we sent out invitations to the 20 to 25 people in that geographic area to have them meet at the home of the contact farmer. In every case, we had almost exactly half of the people who were invited show up.

"At the meeting we explained the program, and because we were running out of time, we had the forms right there to sign them up. We had maps so they could send them back in and tell us which fields they wanted in the program. We said this was not going to be a high pressure deal, but they had 10 minutes to sign up. Of those who came to the meeting, literally 95% did sign up. We had invited the right people."

ATTRITION AND LESSONS LEARNED

In evaluating the turnover between '88 and '89 and the final year, Connelly feels that the farmers who did leave did so because they had spent a good deal of time talking to their consultants and they felt they could do the same chores on their own. In that regard, Connelly felt they made a mistake, because consultants spend far more time in the fields than most farmers think - with as many as six trips through a field during the growing season. The field scouting is only a small part of what a consultant does, he added, with more time spent on the enterprise planning portion of the service. A lesson to be learned in Butler County, Connelly said, is to make sure farmers fully understand and appreciate the extent of the services they are getting from the consultants.

MODEL FARMS DEMONSTRATION PROJECT

In 1989 the Iowa Legislature authorized that \$600,000 be spent to create the Model Farm Demonstration Project. In announcing the project from Elkader (while visiting Big Spring), Governor Terry Branstad said that they would create five "Big Spring Projects" around the state. The general goal of MFDP approximated that of its predecessor IFMDP: to enhance profitability and decrease the environmental impacts of row crop production. What differed slightly from IFMDP with the Model Farm Project was the degree to which specific areas were targeted and marketed. In fact, Hallberg uses that term without apology in describing the strategy behind Model Farms. He points out that agrichemical farming has had three decades of a marketing headstart over sustainability, and it is time to use some marketing methods to reach a wider range of farmers.

In drafting the initial design plan in September 1989, Hallberg spells out the orchestration to be used for the five new "Big Springs:"

"Experience from the Big Spring Basin Demonstration Project and Integrated Farm Management Demonstration Project have shown that to be immediately successful in developing such programs particular local resources should be available. Among these are:

- >a. Local personnel - county extension agriculturalists who can appropriately assist and manage such operations.
- >b. Other established programs that can provide immediate, needed economic, environmental, and crop yield results on new technologies to be delivered to farmers - such as ISU Agriculture and Home Economics Experiment Station, outlying research centers ('Experiment farms'), or Integrated Farm Management Demonstration Projects. The available data from these longer term programs will provide a basis for initial information marketing programs.
- >c. Such projects can also provide an established following or audience for these enhanced programs.
- >d. Local institutions with appropriate programs, where partnerships with the Model Farm Demonstration Project can help to build local resources and infrastructure for long term implementation.
- >e. Other local programs to build upon and maximize economic resources, such as IDALS Water Quality Protection Fund Projects (now under REAP [Resource Enhancement and Protection Program])."

Model Farms operate out of county extension offices using specially hired local coordinators who have crop management expertise to carry out the new ICM programs. In addition, seasonal crop scouts are hired who do soil sampling, pest scouting and who evaluate the forage stands and work with farmers on their enterprise records. Model farms also use existing specialized staff in the extension offices to provide additional expertise and to coordinate with SCS and the Soil Conservation District and any other projects in that area. Information specialists are also used.

Hallberg points out that while Big Spring has qualities which do not replicate easily, if at all, such as its hydrology, it is still possible to capitalize on some emerging strengths of the Big Spring project. Notably in the Basin a sense of farm community was created, as farmers came together around a perceived problem. That same kind of community is attempted in each of the county models. The program intentionally selected county models in divergent portions of the state: the southeast, the south-central, west-central, northwest, and north-central regions.

INDIVIDUAL PROJECTS

There are elements of the program which are shared in the five individual projects. These are:

- a. Nutrient management, including P and K soil testing, the new Nitrogen-soil test, improved calculations of rotation benefits and manure management.
- b. Enterprise record keeping
- c. Integrated pest management
- d. Banding of herbicides for weed control coupled with appropriate limited cultivation.
- e. Improved conservation tillage coupled with d (above) in coordination with soil conservation plans that have been developed by the SCS-District Conservationist.

ATTITUDE ASSESSMENT

The Model Farms also conduct extensive surveys to measure farmer attitudes about adopting new technologies, their feelings on agricultural-environmental issues, and perceived impediments to adopting new technologies. For each cluster of 10 cooperating demonstration farms, about 200 farmers from the general local area are also surveyed.

There is built into the program flexibility to change integrative techniques after the second and third year of the project. In the original plan, Hallberg noted:

"These projects will be designed to demonstrate the viability of cooperative crop advisory services," he said. "services that emphasize whole-farm, crop management planning; in which various services (e.g. soil testing or pest scouting) can provide information to make improved management decisions that reduce the blanket use of fertilizers and pesticides - reducing input costs, reducing environmental loading, as well as handling of toxic compounds by farmers."

TRANSITION

As with Butler County, the Model Farms phase in the consulting fees to farmers over a three year period, becoming self-sufficient private enterprises in their fourth year. Not only does the project reduce inputs of chemicals, but it also creates local jobs and keeps capital in the local area, rather than exporting it to national agrichemical companies.

Where Model Farms differ slightly from Butler County is in their utilization of a wider range of local resources and greater information marketing. In fact, the projects are deliberately positioned to take advantage of special resources in those areas, such as community colleges, or strong conservation or wildlife associations. Marketing messages are aimed at ever-increasing concentric groups of people who surround the 35 demonstration farms in each county project. Allied projects are initiated in the broader community which include conservation tillage, forages and soil testing; and outreach to the general community.

OTHER GPA AG-RELATED PROJECTS

The 1987 GPA recognized that agriculture in Iowa faced possible regulation in several critical areas of groundwater protection, unless major changes were realized in farm practices or conditions. Significant funds have been allocated for research and implementation programs to correct sinkhole runin by agrichemicals; to deal with agricultural drainage wells; and to plug rural abandoned wells. Collectively, these three problems constitute monumental challenges for the state, with its limited (financial) resources. Consider these numbers:

There are 400 to 900 agricultural drainage wells;

There are 22,000 sinkholes;

There are approximately 70,000 abandoned wells.

The manner in which this trio of problems are to be handled has been associated with some of the most controversial legislative debates, which are discussed in more detail below. Target dates for completion of milestones for the individual programs have been subject to change, as has funding and cost-share allowances for farmers. But the original pro-active approach has remained intact.

AGRICULTURAL DRAINAGE WELLS

Agricultural drainage wells present a more circumscribed, if contentious, problem to legislators. These wells, which were built in the 1930s or before, are essentially large conduits sunk vertically into marshy areas, which drain subsoil tile lines to the water table, very much like artificial sinkholes. The ADWs brought thousands of wetland acres into production in the state's so-called pothole region. This northerly area of the state has been divided into agricultural drainage districts, which in the past required that farmers invest in tiling out of their wetlands. Which becomes part of the problem with recent environmental provisions put into national farm policy.

The 1985 "Swampbuster" provisions of the National Food Security Act protect wetlands from further exploitation. When the ADWs were determined to be threats to groundwater - because they behave in a similar way to sinkholes, farmers were left with no good alternatives for closing the ADWs and maintaining their land for crop production.

Iowa has been working on the ADWs from a variety of directions, none of which has proven to be entirely satisfactory at this writing. Iowa has created on-farm research projects at nine sites to look at water flow patterns, chemical rates and other significant components. They are also conducting subsurface water tests on 78 small crop plots on farms, which drain to 26 collection wells. In Humboldt County they are also working with Farm Bureau on demonstration projects that reduce ADW runin.

The Iowa Farm Bureau has worked with the Iowa Natural Heritage Foundation on a pilot project with ADWs. Duane Sand of INHF identified two approaches for the project: 1) plug and return to wetland, with easements for closed drainage wells; 2) leave the wells open but change the farm management practices so that discharge will meet drinking water standards, through the use of trees, grass headlands or other means.

SINKHOLES

The sinkhole problem in Iowa is the most amorphous of the trio. For one thing, because it is a natural phenomena, there are no set number of them to address. Sinkholes are constantly appearing, or disappearing for that matter. The sheer challenge of cleaning out a sinkhole is at times daunting. In 1989 IDALS set out to clean two sinkholes as part of their research into future control of them. A IDNR environmental engineer worked with IDALS at sites in Mitchell and Winneshiek Counties. At the first sinkhole, they extracted 20 tons of steel and 450 pesticide containers which had been tossed into it. At least 50 of those containers had some

liquid in them. At the second sinkhole, they found 10 tons of steel, 14 dry pesticide containers, 127 tires, and 475 cubic yards of other trash - some 47 truckloads worth. The costs averaged about \$7,500 per hole.

Most of Iowa's 22,000 sinkholes are smaller than these two, and very likely contain considerably less trash. But the experiment dramatizes the issue which is before Iowa authorities.

CHAPTER 10: LEGISLATIVE INITIATIVES

The second half of the 1980s was an historic period for Iowa environmental legislation. The 1987 Groundwater Protection Act created both mandates and mechanisms which were acted on by an extraordinary group of committed persons in Iowa's General Assembly. It wasn't a large group. Nor were the victories won effortlessly. Battles have continued.

The control and regulation of pesticides has been an annual issue in Iowa. The issue of standards remain alive. In 1989 the farm chemical industry lobbied for two changes to the Iowa GPA:

1) Distinction between farm chemical contamination in groundwater caused by a specific source and contamination from general field applications. "That distinction is needed because most of the time farm chemical contamination of groundwater results from practices at a specific location," said John Hester, president of IFCA, "such as washing out tanks on the ground, spilling out leftover chemicals or back siphoning mixes into well systems."

2) Passage of specific maximum levels of chemicals in groundwater so that a definition of contamination is understood by everyone.

NEW PROTECTION STRATEGIES

Nothing was changed in 1989. In 1990, however, the Environmental Protection Commission did seriously consider adopting federal MCLs for groundwater drinking sources. That forced countermoves on the part of Iowa legislators and caused a public outcry. The EPC was criticized in editorials and at public forums. Legislation was introduced to create an environmental advocate whose job it would be to make sure the interests of the environment were represented to protect against just such changes in the law.

Legislators were also busy introducing bills which enhanced protection of groundwater from pesticides. With evidence of widespread presence of low levels of atrazine in ground and surface waters, there was a proposed ban on the use of atrazine in parts of the state, with severe limiting of application rates in other parts of the state. Another proposal was to demand disclosure of so-called 'inert secret ingredients' by pesticide manufacturers to designated State offices which would determine the potential health threats posed by them. State actions could then be taken to ban or restrict pesticides based on this new information. Neither of these initiatives passed in the 1990 session, but both were successful, with modification, in the 1991 session.

Iowa also passed a tougher certification process for private applicators and commercial applicators. Unfortunately, the state also recently passed a law exempting young people from certification when they ride 'bean buggies'. Apparently in the minds of some state legislators this constituted a threat to their summer work force. There is obvious irony with lawmakers who are concerned about the supply of cheap summer jobs for kids, but who apparently are not worried that those kids could be getting dangerous exposures to pesticides because they do not know how to handle them properly.

The Iowa Department of Agriculture and Land Stewardship has sought the power to impose civil penalties for violations of the pesticide code. As it is written now, where IDALS suspects a pesticide violation which may require civil penalties, it has to refer the case to the EPA. It is a cumbersome process. Each year IDALS

requests shifting this authority to itself, usually in the wake of pesticide drift cases, but nothing has been changed.

There is evidence that the general public in Iowa is growing less tolerant of the excesses in agriculture. In the spring of 1990 a small town banned applications of pesticides by commercial applicators within the town limits. That ordinance was contested, and in June 1990 the Iowa Attorney General ruled that local governments cannot adopt such an ordinance. That same month, the Lyon County Board of Supervisors made it a crime to allow excessive losses of topsoil where those losses effect county rights of way. The Board was aiming their law at fields where erosion clogs tiles and fills ditches and roadway surfaces. "It gives the county the opportunity to deal with soil loss through enforcement with some teeth in it," said Lyon County Auditor Ken Mellema.

That same summer, in Floyd County, officials refused to reopen a silt-filled ditch until the adjacent landowner had a soil-conservation plan developed. The following year, a plan to build a large hog confinement operation near one of the state's parks was soundly defeated by the General Assembly, and a bill was even introduced to create buffer zones around all state parks of at least one mile, where such enterprises would be prohibited.

SHIFTING GROUND

In general, Iowa has shifted some of its environmental emphasis to a variety of land issues which connect with water quality. The Iowa House has labored without much success at putting through a bill on filter strips along rivers and streams in the state. Even professionals within state agencies have questioned the effectiveness of such strips in stopping runoff or stray pesticide. Since first being introduced in 1989, that legislation has promoted debate on everything from the width of the strips (50 versus 16.5 feet) to infringements on the rights of private owners. Also in 1989 came the Resource Enhancement and Protection Program (REAP). To create this multi-million dollar program, which matched the earlier Iowa GPA in its innovativeness, legislators snared a new source of revenue. In a major coup, the legislators were able to have significant portions of the profits from the state's lottery devoted to environmental programs. The lottery had used profits for economic development programs, but there was a sunset on this stipulation, so the chance was there to corner the approximate \$43 million per year, or a good portion of it.

REAP

The general policy of REAP calls for acquisition and management of new lands in need of protection; the upgrading of public parks and preserves; environmental education programs, additional monitoring and research. Perhaps most significant, it establishes a REAP Congress to meet every two years. The Congress has a broad membership that includes local representatives from cities, counties, conservation groups, educators, as well as institutional and state offices. The assembly identifies the nature of projects which are to be solicited and awarded grants over the next two years. That criterion is passed on to an administrator of the program who will be reviewing the individual applications.

The approach of REAP is to address the interconnected ecosystem of Iowa, keeping it in a sustainable condition. There is a Water Quality Protection Fund within REAP that is administered through the Soil and Water Conservation Districts. It has funds available for: 1) water quality protection projects; 2) water protection practices; and 3) forestry and native vegetation practices. REAP provides a 50% cost-share to farmers who put in such conventional projects as terraces and grassed waterways. It also has per-acre funds for farmers trying no-till, contour farming and strip cropping, and also supports the new ICM approaches.

Most of those funds have been spent in eight priority watersheds selected by IDALS in 1989. Response among farmers was so great that allocations were exhausted within two weeks. Farmers have been using ICM techniques; and also creating windbreaks, establishing woodlots and starting stands of native grasses.

The enabling legislation for REAP called for a 10-year, \$300 million fund, using lottery funds, a special bottle tax and higher fees for atrazine. By 1991 the honeymoon appeared to be over, as Governor Terry

Branstad deappropriated a \$30 million budget for REAP to \$10 million, and did the same for FY92. Environmentalists threatened to take him to court, but did not. It is clear that Iowa will be cutting into its environmental programs significantly through at least 1994, as the state struggles to balance its books.

BARRIERS

Who will pay? That is the question looming over all environmental initiatives in Iowa. Goals which were established a decade ago must now be delayed in their completion because they would be a burden to landowners. It can also be argued that Iowa is in danger of spreading itself too thin, even within the area of groundwater protection. Adding to the array of demonstration programs, conservation efforts and plans which compete for resources are new federal programs. Now researchers in Iowa are also participating in the President's Water Quality Initiative. The EPA, through reamending of the Clean Water Act, has provided approximately \$1-1.5 million per year to Iowa's nonpoint source program in 1990 to 1993.

Taken together, the various conditions in the state suggest the following trends, which will affect legislation and policy making:

- 1) General Support by Farmers. Farmers remain sympathetic to change which they feel makes sense and does not threaten their livelihood.
- 2) Factionalized Farm Population. There is a difference between the attitudes of rank and file farmers and the agenda of commodity groups and specialized farm groups, which tend to be more conservative and hostile towards environmental reforms.
- 3) Widening Problems. The issue of groundwater is now diverse in Iowa. Initiatives are going on among conservationists and preservationists, there are efforts to improve recycling and waste management, and the scene has moved to quasi point-source problems: underground storage tanks and cleanup of contaminated loading areas at agribusinesses, most notably.
- 4) Special Interest. There is more cooperation between segments of the Iowa population who have been singled out for attention by the legislation. For example, when IFCA saw that the 1991 legislative season would bring some kind of crackdown requiring the cleanup of contamination sites at agribusinesses, they responded by working with legislators to draft a positive program, which included a tax on themselves, to underwrite the approximate \$50 to \$100 million it will take to clean up the sites. (This legislation did not pass, however.)
- 5) Shifting Policy. Inconsistent or shifting policies from Washington continue to make it hard for Iowa to achieve inroads in key areas of conservation. For example, in February 1990 Wilson Scaling, then director of SCS, ordered a rollback on soil erosion limits in Iowa, apparently responding to what was perceived to be a hardship by Iowa farmers. In point of fact, that action was taken after Scaling's office had spoken to a handful of disgruntled farmers in one Iowa county, who said they could not stay in business and meet the compliance requirements. His action prompted an immediate and negative reaction among Iowa farmers, state officials and conservationists who pointed out that many farmers had worked hard to meet the federal requirements. The rollback was subsequently scrapped.

As with other states, changes in wetland designations have caused a resurgence of tension between the farming and nonfarming interests, with farmers in the northcentral portion of the state trying to handle ADWs, differing drainage district requirements and now new definitions for wetlands.

- 6) Land Preservation Issues. Protection of groundwater has become more entwined with land preservation and restoration, including wildlife habitat, recreation, and an upsurge in nuisance suits filed by nonfarmers who are living in farm country. Programs such as REAP, have prompted strong debates among Iowans on how the state's resources are to be allocated. Nonfarm groups have pointed out that it is now time to devote more funds to parks and prairies. There is less sympathy for continuing to spend money to make changes on farms which these people argue should be voluntarily completed by the farmers themselves.

CHAPTER 11: THE CHANGING NATIONAL POLICY

During the 1980s, a great deal of energy was expended in working on a national groundwater policy. At least 16 federal laws have references to groundwater quality. But direct language, such as Sections 208 and 319 of the Clean Water Act, are scarce. A review of proposed policies on groundwater protection for the past 12 years shows that some rather insightful documents have been produced. There have been problems in determining which agency shall take the lead, and which emphasis to take with a specific groundwater policy.

U.S. Environmental Protection Agency and the U.S. Department of Agriculture share authority on the nonpoint source program for groundwater protection. EPA clearly has more extensive authority for protection of groundwater from all point and nonpoint sources of contamination, which is specified in over a dozen environmental laws. USDA has the tradition of serving the agricultural sector, including soil conservation; and in addition also has the statutory authority to be involved in some aspects of pesticide regulation. Other agencies, such as U.S. Geological Survey and the Department of the Interior also have an interest in groundwater, and in fact have periodically played larger or smaller parts in the national effort. But budgetary constraints, particularly since 1988, have forced national policy makers to shape initiatives to match the agencies which have the resources to carry out new programs; and to prioritize their emphasis. That has moved the focus to agricultural nonpoint source contamination, which has been largely unregulated to date. USDA has shouldered more responsibility for groundwater initiatives, because it has more resources than EPA to address nonpoint source (NPS) contamination.

Historically, USDA has alienated environmentalists because of its insistence on a nonregulatory approach to NPS controls in agriculture. The movement towards interagency cooperation is encouraging, evidenced in the 1990 farm bill; the reamending of the Clean Water Act in 1987 and its Section 319 NPS program which is being implemented; and the President's Water Quality Initiative, begun in 1990. The thread running through these programs is that they utilize nonregulatory strategies, sometimes with sanctions; and that they recognize the need to pool informational resources while enlisting ever-expanding layers of local assistance.

THE EPA APPROACH

The primary effort of EPA is to develop an effective national policy using the authority contained in Section 319 of the Clean Water Act. In a memo from LaJuana Wilcher, Assistant Administrator for the Office of Water that operates the NPS programs, the program is described as having a two-pronged attack. First, EPA will support state NPS programs. Half of state grants are to be administered for their most important problems. Ten percent of all Federal 319 funds are to go specifically for groundwater programs. Secondly, five percent of the Federal 319 fund is to fund national groundwater models.

Coordination is institutionalized in the program by requiring states to describe their intergovernmental coordination and public participation to implement BMPs and other controls of NPS pollution. EPA also provides guidance with working programs in watershed projects. Stuart Tuller, of the Nonpoint Source program office, USEPA, has worked on the specifics of the 319 program, which is to be submitted to Congress by 1992. "When Section 319 was passed in 1987," he explained, "there was a very strong support for moving in a more regulatory direction than we actually have. There is some regulatory language in it, but the basic approach is voluntary education.

"We will try the voluntary approach for about four years, until the new CWA reauthorization in 1992, for which we are gearing up now. But there was a lot of skepticism on the part of people who don't think the voluntary approach can happen rapidly enough. So we are probably going to have to turn to a stronger regulatory approach in 1992.

"There is evidence that Congress is somewhat impatient with the progress that has been made the last four or five years. The coastal legislation that has passed in the fall of 1990 [CZARA] requires special NPS programs in coastal areas. It requires that BMPs be implemented in coastal areas. And in addition to that, if these measures do not control the problem, then individual land owners, and land managers could be required to adopt even more stringent measures. This is close to the approach we now have for point source control - with effluent guidelines for particular industries and sewage treatment plants. There is discussion that the coastal legislation is meant to be a test run to see if this approach is feasible, with the thought of extending it inland across the country in the Clean Water Act."

In the Coastal Zone Act Reauthorization Amendments (CZARA) of 1990, Congress directed EPA and NOAA to work with the states to develop and implement management measures for nonpoint source pollution to restore and protect coastal waters. What is perhaps remarkable about CZARA is that unlike other water quality programs it does not first require establishment of specific pollution problems at arbitrated rates and subsequent crafting of response plans. CZARA focuses on systematic implementation of technological programs which have been proven to prevent or reduce pollution. It also addresses NPS from urban areas, forestry, streambank and shoreline erosion, marinas and recreation boating. It also calls for the states to develop enforceable policies for implementation.

**SIDEBAR:
THE EXAMPLE OF
CHESAPEAKE BAY**

The coastal model has precedence in the early Rural Clean Water Program, which was funded in 1980; and in the Chesapeake Bay Program, initiated in 1985. The RCWP created 21 projects in 20 watersheds around the country. The Chesapeake involved the states which bound the country's largest estuary. Both projects received mixed evaluations as to their effectiveness. In both programs, the conclusion was that changes had not been sufficient to achieve the original goals.

In the case of the Chesapeake Bay Program, the goal of the project was to reduce nutrient loadings into the Bay from NPS by 40% before the year 2000. In December 1990, an interim report was assembled by a select evaluation panel. They concluded that "unprecedented and unparalleled achievement" had been made, but the panel found that the NPS control programs in place were not sufficient to ensure meeting the 40% reduction goal by that year.

"We believe that current programs must be improved and supplemented if the states are to make certain that their efforts will be successful," the report continued. "We recognize that strengthening the program will require the allocation of additional resources to NPS control, as well as re-allocation of current resources."

Among individual criticisms of the program, the evaluation panel cited low participation by area farmers in conservation programs; spotty data on water quality for purposes of comparisons; insufficient BMPs to attain the desired goal; and several flaws in the administration of the Bay program. "There was no systematic planning that captures all aspects of the nutrient management problem, including the wide range of sources and variety of regulations and nonregulatory mechanisms for controlling loadings."

SAFE DRINKING WATER ACT

The Safe Drinking Water Act (SDWA) deals with select problems associated with public water supply systems. Four of its programs also deal with groundwater protection in various forms. First, SDWA is responsible for establishing drinking water standards for 83 contaminants, as of this writing. It also establishes primary drinking water regulations for contaminants whose health effects are not known. These primary regulations require the use of the best available technology for treatment available. Many states currently use SDWA standards as their groundwater standards for determining if and when action needs to be taken.

SDWA's second area of groundwater control is in the regulation of injection wells, including agricultural drainage wells. It has its third area of concern with sole source aquifers which are resources of primary drinking water supplies.

The final area of concentration is with the Wellhead Protection Program (WPP). WPP provides grants to states to create protection area plans around a well-field supplying a public water supply. The WPP has been identified as one of the potential instruments which could be widely used for NPS control. It has a strong local component which spells out how communities can use zoning ordinances, design standards, source prohibitions and groundwater monitoring in their strategy. Included as part of this process is the Geographic Information System (GIS), which is being developed at the state and Federal level. GIS can provide enormous amounts of information by superimposing data that previously existed in separate agencies, such as the location of underground storage tanks, position of area shallow aquifers, permeability of soils which can be ganged together to better understand local vulnerability.

PESTICIDES

EPA has also been involved in regulating agrichemicals. In 1988 EPA developed a proposed strategy for pesticides in groundwater. That strategy included ideas for protecting critical and vulnerable groundwater supplies through the use of BMPs, label restrictions and related ideas. EPA has worked on a pesticide container recycling program. Animal species have been identified throughout the country who are endangered by pesticide spraying, and states can restrict the use of pesticides where the threats become serious.

On November 13, 1990, EPA released its long-awaited National Pesticide Survey, which had taken two and a half years and \$12 million to complete. The survey did random tests of 566 public wells and 783 domestic wells. It found that 10.4% of community water supply wells and 4.2% of rural domestic wells detected pesticides or pesticide degradates. Over 50% of the wells had detectable nitrate. In the wells surveyed, 1.2% of public supplies and 2.4% of rural wells -- over 250,000 wells -- had nitrate levels that exceeded the MCL of 10 parts per million. About 0.6% of wells had at least one pesticide detection which exceeded MCLs.

USDA APPROACH

PRESIDENTIAL WATER QUALITY INITIATIVE

The Initiative was unveiled in February 1989, with funding for 1990. The program takes advantage of infrastructure already established within USDA that is dealing with NPS. The philosophy is to design water quality programs to accommodate both the immediate need to halt contamination, and the future need to alter farming practices that may threaten the environment.

USDA's component of the Initiative is the Water Quality Education and Technical Assistance Plan, which involves the resources of ASCS, Extension Service; SCS with educational, technical, and financial assistance;

and ARS and CSRS in research. The plan has three principle components: education and technical assistance, research and development, and data base development and evaluation.

Five activities are undertaken within this program:

- Demonstration projects (ES lead, ASCS financial assistance, SCS technical assistance)
- Nonpoint Source Hydrologic Unit Areas (SCS lead, ASCS and ES support)
- Regional Demonstration Project Initiatives (ES lead, SCS support)
- Water Quality Special Projects (ASCS lead)
- Technology and Data Base (ES and SCS)

USDA has set up 24 demonstration projects to show the effectiveness of select BMPs on water quality. There are 275 nonpoint source hydrologic unit areas around the country whose water quality is being restored by addressing local agricultural water quality problems. The hydrologic unit areas must be in state designated Section 319 priority programs. There will also be special attention to large regional water quality problems, such as the Chesapeake Bay, Colorado River, Great Lakes, Gulf of Mexico, Pudget Sound and 'Land and Water 201' (in Tennessee Valley Authority area). Under a memorandum of understanding, USDA is also working on these projects with such agencies as the National Oceanic and Atmospheric Administration, EPA and U.S. Geological Survey.

In its program description of the Plan, USDA underscores the importance of interagency cooperation. "Cooperation between agencies and organizations at all levels is essential to an effective program for reducing nonpoint source pollution. To ensure coordination, SCS and ES chair the Water Quality Education and Technical Assistance Committee, comprising some USDA agencies, EPA, USGS, NOAA, the National Association of Conservation Districts (NACD), and the National Association of State Conservation Agencies (NASCA). This committee will review and coordinate water quality objectives, the selection and implementation of hydrologic units, demonstration projects, and assessment activities."

Vivan Jennings, who presided over the original Ad Hoc Karst Committee, is now Deputy Administrator of USDA-Extension, with responsibility for the Water Quality Initiative. He noted that the Federal model does incorporate lessons learned in Iowa in terms of interagency cooperation. It is also a program which has a strong emphasis on accountability and evaluation, as does the Iowa plan. Finally, it resembles Iowa in institutionalizing dialogues between participating agencies.

"We meet on a weekly basis to come up with a roles document for each of the activities," Jennings said of the new Water Quality Initiative. "We also encourage states to do the same thing at the district level, and with county agents, and district conservationists who can get together and establish linkages and partnerships. At that level, we find, cooperation can work fantastically, particularly between SCS and Extension."

The USDA Water Quality Initiative has yet to be fully funded, however.

MSEA

A major component of the USDA research plan is the Management Systems Evaluation Areas program (MSEA), which is a two-stage plan to integrate research, monitoring, and technical education -- *a design it borrowed liberally from the BSBDP*. The program objectives are to: 1) assess the extent to which, and range of conditions under which agricultural chemicals reach groundwater; and 2) evaluate new and improved management practices that protect groundwater. MSEA establishes technical and coordinating committees among various cooperating agencies and institutions which will map out the research and implementation plans in detail. The interdisciplinary teams have specific assignments to look at cost-effective ways of reducing chemical losses. ARS coordinates data collection from the projects, and ERS develops the cost analyses of farm management practices. SCS standardizes information about soil types and landscapes. ASCS provides input on cropping history. Extension provides quality control at the research sites to insure that they are germane to real farm situations. The U.S. Geological Survey and state counterparts provide expertise on the

hydrologic components of the initiative. The MSEA sites are in Iowa, Missouri, Nebraska, South Dakota, Minnesota, Wisconsin and Ohio. Eventually, the hope is to have systematic, integrated data which will allow advisors to look at any particular farm and devise a cost-effective management plan for that farmer which will take into account the land, the hydrology beneath it, economic needs, and the corresponding farm practices that need to be utilized.

THE 1990 FARM BILL

The 1990 Farm Bill had a shift in its environmental sections away from the strong soil conservation emphasis of 1985 to broader elements which include groundwater protection. Among the pertinent provisions of the Bill are:

- + Creating an Office of Environmental Quality within USDA and an interagency Agriculture Council on Environmental Quality.
- + A Water Quality Coordination Program in each state, to coordinate USDA's Water Quality Programs.
- + An Environmental Easement Program, to protect environmentally sensitive lands and also reduce the degradation of water quality.
- + A Natural Resource Conservation Management Plan, developed within the Department of Interior, providing 100% cost-share for qualifying lands.
- + Amending of the Watershed Protection and Flood Prevention Act to assist states in developing farmland protection programs.
- + A Small Watershed Program is amended to provide new water quality benefits to states to fund farmland protection programs.
- + Expanded sustainable agriculture research and Extension training programs.
- + The Integrated Farm Management Program, which would enroll between 3-5 million acres a year through 1995, using contracts of three years in length, (set up on the Butler County scheme).
- + Flexible Base Acreage Allowances, which are aimed at allowing farmers to be more diverse in their crop rotations, which will reduce the need for agrichemicals.
- + An Agricultural Water Quality Incentives Program which would have had 3-5 year agreements with producers on water quality management programs which also provide wetland protection and benefit wildlife. It would also offer technical assistance and educational materials. This legislation was not funded.

REPORTS, ETC.

In the past two years, in addition to the programs already noted, EPA/USDA published many reports, books and conducted conferences and seminars on groundwater issues. More formally, the following important documents were released:

- July 1991. EPA - "Protecting the Nation's Ground Water: EPA's Strategy for the 1990s; The Final Report of the EPA Ground-Water Task Force."
- October 1991; EPA - "Pesticides and Ground-Water Strategy."
- December 1992; EPA - "Final Comprehensive State Ground Water Protection Program Guidance." (National Consolidated Ground Water Strategy)
- 1992; USDA issues strategic initiatives "A Productive Nation in Harmony With A Quality Environment."
- 1992 EPA and USDA sign an agreement to develop a joint Agriculture Pollution Prevention Initiative.
- 1992 (For 1993) EPA and manufacturers issue label changes restricting atrazine use nationwide.

SIDEBAR: NPS CONTROL, THE PROS AND CONS

The Office of Technology Assessment, in *Beneath the Bottom Line*, published November 1990, evaluate agriculture's impacts on groundwater. Included in the lengthy report is a summary of the advantages and disadvantages associated with voluntary, regulatory or cross-compliance NPS control programs. Here are the results for each approach:

Voluntary Programs

Advantages

- + Politically acceptable
- + Provides greatest flexibility for farmers
- + Allows easier adjustment to changes in technical knowledge
- + Participants can take preventive approach.

Disadvantages

- Low participation when incentives are inadequate
- Participation uneven or inadequate where most needed
- Pollution control measures subject to local approval or interpretation as to what is politically,
- Implementation depends on adequate public support
- High cost in personnel, time, and funding
- Long time lag (up to 10 years) for planning and implementation.

Cross-Compliance Programs

Advantages

- + More politically acceptable than regulatory approaches
- + Can ensure that Federal program benefits do not subsidize pollution.

Disadvantages

- Implementation depends on participation in base program, not on severity of pollution problem
- Low participation when base program economically unattractive to farmers
- Pollution reduction incentives disappear when base program participation discontinued
- Establishes resource protection as an objective secondary to production
- Depends on adequate technical and administrative support
- Subject to local pressures to weaken approved pollution control measures
- Subject to administrative modifications
- Long lag time before pollution control measures implemented.

Regulatory Programs

Advantages

- + Provides consistent rules and expectations for farmers
- + Can be uniformly applied
- + Faster in achieving pollution reduction.

Disadvantages

- Offers least flexibility for farmers
- May be politically opposed by farmers and their representatives
- Likely to raise production costs and create differential economic impacts
- Enforcement difficult and costly
- Difficult to change rapidly in response to new information or changes in technical knowledge
- Tends to be specific for single resource concern; difficult to design based on complex systems
- Potential for excessive controls in areas that do not need them and inadequate controls in areas where pollution problems are severe.

December 1992; EPA -- Office of Water, Management Advisory Group issues recommendations on Nonpoint Source Programs. In connection with this recommendation, GAO reviews NPS programs and calls for Congress to fully fund NPS program.
1992-1993 EPA begins developing a new Nonpoint Source Strategic Plan.

THE ENVIRONMENTAL FACTOR

John Blodgett of Congressional Research Service has examined the potential regulation of agriculture to reduce its impact on groundwater quality. He believes that the environmental community has gradually realized the problems of establishing a regulatory program with farmers. He also believes that it is clear that only precise Federal policy carried out in critical areas can accomplish significant changes in agriculture.

"In trying to do something nationally, whether it is incentives or recruitment or education," he said, "you first run up against the inevitable fact that farming is such a decentralized and different thing. Even within the same county you can have different agronomic settings or geologic settings. You have a huge pragmatic problem in that sense. For one thing, to the extent that you rely on voluntary action or incentives, you clearly have major deficiencies. Theoretically, you ought to end up paying the people who need it the least, less. Or, if you pay the people who need it the most, you may be rewarding bad management, and not giving anything to people who do good things on their own.

"States like Iowa, Minnesota or New York, if they do some aggressive things to protect the environment, the farmers in those states may find themselves at a competitive disadvantage with states who don't take comparable actions.

"That has always been the major factor driving Federal legislation in the environmental area - to try and maintain a level economic playing field in terms of the cost of environmental protection. Consider crop rotations. I believe the reason the farm bill doesn't encourage rotations relates to technical matters of how it effects payments in the commodity support programs; and problems of economic dislocation which would result from what gets grown in those rotations. If we allow more rotation to diverse crops, it will inject more food grains into the pipeline. Many growers, even organic producers, fear this, though I am at a loss to understand their reasoning.

"Farmers are also disinclined to rotate because they can't make as much money off that acreage during the rotation. You either would produce hay and alfalfa for a market that doesn't need it; or you would have to bring in livestock to have a more balanced farm. It looks to me that those alternatives by and large take more intense management skills."

SIDEBAR: A FORUM ON FARMING AND THE ENVIRONMENT

In the spring of 1989 a series of workshops were held by the Environment and Energy Study Institute in Washington DC. They brought together agricultural specialists, farmers, lawmakers and water quality experts to lay out 'The Big Picture'. The results of this and similar symposia give us a better idea of the challenges we face in drafting agricultural policy which serves farmers and protects the environment. Some of the remarks of that EESI forum are as follows.

Dr. Doug Young, Washington State University.

"Land set asides in the 70s and 80s have periodically been very high. Acreage reduction programs are fueled by paying subsidies or deficiency payments proportional to farmers production.... If we had

let the market work in the 60s the problem would have solved itself. Prices would have declined, production would have declined, the intensity of inputs would have declined.

"The problem with programs is the selectivity and structure of the farm programs. They only support 50% of crop and livestock production and they are structured in ways that make payments proportional to output.

"The selectivity of the programs, paying farmers for feed grains and food grains and cotton, tends to encourage input use, agrichemical use, and in and of itself, these crops absorb the majority of the agricultural chemicals, some 65% by our estimates.

"Also, there has been an increasing trend in fertilizer use on those crops. The big four program crops of corn, wheat, cotton and soybeans have increased their share of total fertilizer use from 42% about 20 years ago to 62% more recently."

Young suggests that we promote economic efficiency and equity, promote low-input sustainable agriculture (LISA) and conventional agriculture in more neutral ways to avoid influencing farmers, and target payments for environmental and social goals.

Bruce Larkin, Kansas farmer and member of Kansas legislature.

"If (the farm program) discourages the clover-alfalfa rotations which would allow us to build our soil and put natural nitrogen into the soil. It basically is extremely expensive, because on set-aside acres, unless you're in a disaster area, you're not allowed to utilize any of the benefits from the clover-alfalfa rotations. You can't hay them or graze them or take a seed crop.

"So basically the expense that you have of planting a clover and alfalfa, the only benefit you get back out of it is the fertilizer, and that will not meet the amount or the cost, you know, for what you could purchase commercial fertilizer for.

(The late) Dixon Terry, farmer, Iowa Farmers Union.

"The changes I think we need in programs fit into about four areas: Number one, to farm sustainably and to move farmers to a more sustainable practice, there has to be price stability at higher levels. I think every farmer on this panel has made that point. Without the guarantee, without the stability of price supports at a level to cover costs of production, you're going to see hidden costs....

"Second, there will need to be market controls, which will discourage excess chemical use. Third, we will have to deal with the increasing concentration of agriculture and the food sector. "Concentration turns an environmental asset into one of our worst problems in the form of pollution from animal manures. To deal with concentration, we need to reform and enforce antitrust laws in this country and stop vertical integration, which is proceeding at an amazing rate. The majority of packers in this country are increasingly contracting their hogs and controlling production from the farm level to the point of the retail level."

Dr. Katherine Reichelderfer, Economic Research Service, USDA.

She emphasized that without the availability of risk-reducing safety nets such as the farm programs, production would be distributed much differently, concentrated in areas with a natural competitive advantage through lower average production costs, fertilizer use, pesticide use and soil losses.

"The consistency aspect of compliance schemes, while laudable, can prove also to be their downfall," she continued. "For example, Sodbuster, Swampbuster and Conservation Compliance were not just made consistent with other farm programs, they were inextricably linked with them by virtue of the fact that enormity of the penalty for non-compliance is a function of the attractiveness of the other programs' benefits. This relationship works fine when there are conditions of surplus and low commodity prices, such as when a legislation is formulated.

"But now with depleted stocks, rising commodity prices, and optimistic market prospects, the tight linkage between programs may be a disadvantage, as commodity program payment levels decline, either from legislated or unpredicted reasons like the drought, the penalty for noncompliance also diminishes."

NATIONAL WAVERINGS

Since drafting the 1990 farm bill, adjustments have inevitably been made. Sustainable agriculture was funded at a fraction of what was originally requested. Even USDA's Water Quality Initiative has not been significantly funded for its technical assistance components at this writing. Like Iowa, good legislative programs have been blunted in their impact through delays in funding, reduction in funds, and persistence by special interests who are intent on blocking the initiative.

Part of the problem is in the sequential nature of national legislation. In this instance, groundwater policy and related provisions in the farm bill were drafted initially by a diverse body of authors, which included environmentalists and persons in the sustainable farm movement. Those policies were shaped in committee with strong influence by special interest farm and commodity groups. After various compromises the law was passed along to persons who must live with the laws for five years. The visionaries are no longer involved, and even legislators have moved on to other projects. Little wonder farmers are skeptical when they see new requirements, deadlines or standards aimed at changing their practices. *They have seen it all before.*

SECTION V. THE FUTURE

Overview

What may be ultimately most important about our responses to threats to groundwater, at least in Iowa, is that it forced agencies to think creatively and cooperatively to address the problem. Agriculture, which has been relatively exempt from regulations of practices in the past, has been altered by the new approaches which an interagency approach fostered. Irrespective of the issue of mobilizing state resources to address agricultural nonpoint source contamination of groundwater, there is the larger issue of environmental philosophy which has been shaped by the exercise.

It is clear that we are in the middle of the transition begun by this new approach, so that the precise blend of volunteerism and regulation has yet to be determined. Evaluations of changes in farming practices and continued evidence of contamination of groundwater and surface water shows that this is true. But the good news is that we now recognize the mistakes of the past, and are trying to avoid them, as *Ken Cook* points out, from the Center for Resource Economics:

"The soil erosion control model with SCS is not a bad model," he explained. "But we spent 50 years and 20 billion dollars on a voluntary tradition, and still in 1985 we had to recognize that a big portion of the job had not been done or ever would be done, if we relied exclusively on voluntary measures.

"We have come to that point in water quality sooner than 50 years, and before we have spent \$20 billion is my bet. What happens now, I don't know. We cannot do another quasi-regulatory measure like we did with Swampbuster with SCS. Leaving aside the technical inadequacies and workload factor - which to me is the most significant argument against regulation, there is still the toughest battle of politics."

In *Beneath the Bottom Line*, the OTA task force found four primary obstacles to solving the problem of agricultural contamination of groundwater:

1) Inherent obstacles such as nonpoint source character of contamination and the complexity and variability in site characteristics; 2) intrinsic obstacles, derived from the functioning of agriculture within natural cycles and the 'systems nature' of U.S. agriculture; 3) extrinsic obstacles deriving from the diverse characteristics of farms and farmers, the nature of the current structure of U.S. agriculture, and the nature of agricultural and economic policies; and 4) over-arching obstacles posed by the organizational histories and structures of agencies involved in administering agricultural and environmental policies and programs."

Nowhere have the resources of education and voluntary change been so broadly marshaled, with such mindful attentiveness to the pitfalls laid out by OTA's report, as in Iowa. Iowa has over 90% of its surface area devoted to agricultural production; typically 60% used for high-intensity row-crops. Agriculture is still Iowa's leading source of income. Iowa had for decades perfected high-input, high-output specialized production which is also heavily capitalized and dominated by other constraints which discourage alternatives. Iowa has also been an historic center of conventional farming methods, associations and agribusinesses. If the groundwater strategy utilized in Iowa succeeds, then it may be replicable to other areas of the country, even to a national policy. If it does not, then it could mean an abandonment of the new marriage which was created by the union of the farm community and environmentalists.

CHAPTER 12: THE WIDENING COVENANT OF RESPONSIBILITY

The REAP program described earlier is an example of the wider application of the process identified with the groundwater strategy. Once again, Iowa has been recognized nationally as a leader in the creation of an innovative environmental program. It has also been acknowledged in the same way for its energy conservation program. But with the recognition has come some criticism within the state that environmental legislation has gone too far. In 1991, when Iowa's Governor Terry Branstad was forced to deappropriate funds, environmental programs took some of the deepest cuts. The stress of facing another round of economic hard times in Iowa, as was done here in the early '80s, may cause a backlash to environmental initiatives, or at least slow down the nonregulatory programs. If that were to happen, then it could prompt the very regulations which people have tried to avoid.

The other significant direction which evolution has taken in Iowa is to deepen and broaden component programs within the groundwater strategy. The same kind of holistic, broad reaching effort mounted for groundwater protection and allied sustainable agriculture, also inspired Iowans to create equally innovative programs in alternative energy, in enhancement of rural land resources, and in the area of rural health. Everyone is better off because of these efforts, but in a state with limited resources they have had the sad effect of hurting sister programs. Critics have had an easier time of attacking them, perhaps with some economic justifications.

THE CHEEC EXAMPLE

The Center for Health Effects of Environmental Contamination (CHEEC) was authorized by the 1987 Groundwater Protection Act to evaluate potential associations between drinking water contamination and their health effects. It has been the central data collection point for health and groundwater information in Iowa. CHEEC is accumulating a computerized historical database of Iowa community water supply sources, using the Municipal Water Supply Inventory that is maintained by IDNR.

In conjunction with IDNR, CHEEC conducted the first statewide rural well water survey (SWRL), which was critical for establishing baselines that can be used for the state's nondegradation approach to groundwater quality. In the study, 686 sites took a total of 1,048 samples. SWRL data and other monitoring was utilized in 1991 to impose restrictions on the pesticide atrazine.

The existence of CHEEC as a collaborative entity has already lead to innovative projects which go beyond its responsibilities to groundwater. In September of 1988, a conference was convened which involved several of the original Karst Committee members of the groundwater initiative. Concerns about agricultural health issues identified a broad spectrum of risks to rural families, among which were the effects of agrichemicals. But there were many other dangers on the farmstead which made farming the most dangerous occupation in the country. To address the full range of issues, The Agriculture at Risk conference was convened. It included experts from both the University of Iowa and Iowa State, and was co-sponsored by the Institute for Agricultural Medicine and the Northwest Area Foundation. A national symposium was held in Des Moines and Iowa City on the topic, "Agricultural Occupation and Environmental Health: Policy Strategies for the Future." A combination of laypersons, health scientists, policy makers, legislators, commodity groups and academia worked through a variety of forums to produce *Agriculture At Risk*, a significant report which was passed along to appropriate policy makers. That lead to the creation of the National Coalition for Agricultural Safety and Health, with 29 representatives from across the country. Its function has been to advise on national policy, such as the National Agricultural and Rural Health Act, and to help coordinate research initiatives and help with state legislation around the country.

As part of that symposium, individuals involved in discussions on pesticides and their health effects decided to create the Iowa Center for Agricultural Safety and Health (ICASH). A seed grant was provided through CHEEC to implement the goals of ICASH.

ICASH is a pyramidal organization whose apex is represented by the client farmer, with a layer of local action groups arranged below the client, to mobilize local community resources; with the ICASH base of facilitating expertise comprised of such resources as commodity groups, producers, Extension, physicians and about 20 organizations in all. The mechanism harkens back to the old days when farmers at Big Spring told policymakers and service providers exactly what they needed. The pyramid of ICASH translates problems into projects which are quickly acted upon. ICASH has worked with rural doctors and nurses to better identify and treat farm-related illnesses which have tended to be misdiagnosed in the past.

In September 1990, the participating departments in these programs were awarded \$12 million in four grants, to conduct various agricultural-related health studies. The work ranges from pesticides and health, to improved farm safety. The combination of human resources working in a coalition, plus the record of real action by the members, was responsible for obtaining this significant fund.

THE LEOPOLD CENTER MODEL

When the Leopold Center was assigned to the Iowa State Campus during the legislative drafting of the 1987 GPA, it was predicted by some observers that the mission of the Center would be altered. What has in fact happened is that the Center has expanded its influence into the traditional departments at ISU.

One of the ways this has been accomplished is through the creation of interdisciplinary "Issues" teams that tackle large problems of rural and agricultural life. In one project, for example, landscape ecologists and landscape architects are working with conventional agronomy experts to apply their collective knowledge to conservation strategies. Another Human Resources Team did a very insightful analyses of the attitudinal differences between farmers who are predisposed to farm in more sustainable ways versus those who prefer conventional systems.

By giving new voices a say in the development of agricultural policy and research, as these teams do, there is a nurturing of the kind of ethic and thinking about land use which was expressed by the man whose name the Center wears, Aldo Leopold. In the Preface to *Sand County Almanac* Leopold wrote:

"We abuse land because we regard it as a commodity belonging to us. When we see land as a community in which we belong, we may begin to use it with love and respect.... That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics."

The Leopold Center has been in a position to do innovative education in such key areas as the work done with fertilizer dealers and their introduction to the late spring nitrogen testing kit. By utilizing dealers in the early development of the kit, designers were able to tap their consulting skills, and also to make them feel included in this sustainable effort. That same kind of enlistment has gone on with the Center's program to give orientation sessions to Extension agents on sustainable practices.

SIDEBAR: TAKING ON THE PRACTICAL AND ESOTERIC AT LEOPOLD

Typical of 1990 Leopold Center grants were:

- * A study of how native prairies improve soil tilth and the amount of time it takes to achieve a response.
- * The effectiveness of vegetative filter strips to prevent chemically-laden water from entering streams or other water supplies.
- * Alternative weed management for corn fields.
- * The use of processed sewage as a fertilizer.
- * Alternative 'crops' from woodlots.
- * The impact of agricultural pesticides on wildlife, and establishing a balance for their use which does not effect them.
- * Working with fertilizer dealers on using a new soil test for nitrogen.

MARKETING COMES TO FARM DEMONSTRATIONS

A new approach was required for the presentation of farm demonstrations to the client population. It has been critical to monitor the attitudes of farmers more closely. Steve Padgitt conducted two surveys for IFMDP in 1990. One survey looked at Integrated Pest Management and its use in IFMDP and the Butler County Project. The second survey evaluated the impacts of strategies used in the Model Farms program, including the new Extension programs, technical assistance and adoption of new practices, including IPM and ICM.

Padgitt found in the IPM survey considerable interest in IPM principles, but many farmers may have had a false consciousness regarding the extent they are currently practicing IPM. The interest in scouting services, at the current costs, is low. From the admittedly small sample of Winneshiek County farmers which he took, Padgitt saw three patterns emerge: 1) concern about agriculture and groundwater issues appears stable from 1986 through 1990; 2) differences remain between farmers and non-farmers; and 3) farmers are experimenting and refining weed management practices.

On the IPM survey, about 60% of farmers returned the mail questionnaire. Of the 220 who did, half said they "always," and another 28% "sometimes" scout fields for pests or take other preventive measures. Yet when asked more specifically about how often they did these practices, it turned out that only 16% had walked fields six or more times, which is considered necessary for adequate scouting. "This suggests a substantial number of farmers may perceive themselves practicing IPM, but in fact are doing so with less rigor than needed to experience optimal results of IPM."

The survey found that 16% of respondents used a crop scouting service, and 27% had in the past. Only 5% were willing to pay for such a service, while one-third would be interested if the program were subsidized at the 50% rate.

Comparing this to earlier surveys, Padgitt found, "In 1986 respondents were a bit less concerned about the national health effects of agricultural chemicals than effects in Iowa, Winneshiek County, and on their own farms. In 1990, concern for the national level was equal to that expressed for Iowa and Winneshiek County. In 1990, least concern was expressed for problems on one's own farm."

Padgitt found farmers most often changing weed management practices, then their livestock enterprises. Some had also lowered their use of nitrogen. "If the small sample reflects more general patterns," he concluded, "then there is promise that the level of interest in how agricultural practices affect groundwater quality not only remains three years after the state passed major groundwater legislation, but that farmers are also making refinements in weed management practices. Farmers are not abandoning the use of herbicides, but their responses suggest less materials are being applied (through banded applications) and reduced toxicity (from selecting nonrestricted over restricted use products). Also, the move to post-emergence over pre-emergence products could signal tailored herbicide applications to *confirmed* problems, rather than blanket, broadcast applications.

"Although the findings reported must be regarded as most tentative, and practice change appears to lag in comparison to recent Big Spring surveys, it could signal a pattern for practices being promoted in IFMDP to be diffusing more broadly. The general stability in attitudes is encouraging and conducive to further refinements in practices."

A SENSE OF COMMUNITY

The lag in practice changes between IFMDP participants and Big Spring Basin farmers suggests the importance of community awareness for change. Big Spring has utilized a media coordinator for years. It is a region where meetings are common among participants and nonparticipants over issues relating to groundwater and farm practices. Local newspapers feature the various demonstration projects on their front

page, and on-farm field days are publicized social events as well as educational opportunities. Certainly it is a lot of effort to deliver this kind of saturation of the consciousness to local farmers, but the point is that it may take just such an effort to elicit the desired effect on the general farm population.

Where a sense of community exists, almost all other essentials necessary to achieve a goal will follow. Researchers *found* a community in Northeast Iowa. The Karst Committee became a community, and gave birth to other communities. The best defense against the many critics, challenges and barriers that confront projects is to maintain that sense of community. Hallberg reflects that in Iowa, evolution and growth lead to the spawning of several communities. Among them are the new communities of farm producers who are carrying out sustainable agriculture on their own.

SIDEBAR: CHANGE IN FERTILIZER NITROGEN USE BY FARMERS IN THE BIG SPRING BASIN.

One measure of success of the Big Spring Basin Demonstration Project efforts is the substantial reductions that BSB DP farmers have made in fertilizer nitrogen application rates, with no reduction in crop yields! The decade's results are as follows:

Rotation	Basin average fertilizer-nitrogen rates				Average yields
	All corn	1st-yr corn after alfalfa	2nd-yr corn after alfalfa	Continuous corn	Continuous corn yields
Year	--- pounds fertilizer-nitrogen per acre ---				bu/acre
1981	174	123	160	178	128
1982	174	123	---	178	138
1984	158	115	155	169	130
1986	147	96	---	153	149
1987	149	84	121	157	141
1988	141	84	124	151	79
1989	138	82	125	148	147
1990	123	66	121	145	145
1991	117	59	112	131	---

In *Beneath the Bottom Line*, OTA's task force addressed this issue as well. They found that producers are most likely to adopt farm practices which:

- 1) Have clear, documented advantages over other practices;
- 2) Are compatible with their current practices and previous investments;
- 3) Are easy to implement;
- 4) Are capable of being observed or demonstrated;
- 5) Are capable of being adopted gradually or incrementally.

CHAPTER 13: WHAT'S MISSING?

It may seem strange to conclude an examination of Iowa's groundwater initiative by asking the question, what is missing? The presumption is that Iowa's programs have been successful. Why then should anything be missing? Does this mean there is only the illusion that Iowa has made progress? Not at all. Iowa has been very successful. But participants occasionally wonder if the initial goals of groundwater protection have not been transformed into something else. Has there been an evolution or metamorphosis in Iowa, and should we be concerned for either situation? Finally, "What's missing?" does not only apply to Iowa. In fact, skeptics usually point out that Iowa enjoyed special circumstances which cannot be replicated elsewhere. What other states are 'missing', under this rationale, is that they are not Iowa.

IS IOWA UNIQUE? A FEW OTHER VOICES

Vivan Jennings (USDA Cooperative Extension Service) sees agriculture's reaction to its own environmental degradation of groundwater as coming within a public issue context. The issue prepares the farmer for change, and at that moment solutions must be supplied. He said Iowa was fortunate to be working on solutions at the same time the issue of groundwater contamination from agrichemicals was building as an issue statewide among the farm and general public sectors.

"Other states are back at the start of the bell curve," he described. "It hasn't become an issue yet for them among their farming population. And that is what we are betting on, so that with publicity we can change their attitudes - before it becomes a catastrophic issue in their state."

John Blodgett (Congressional Research Service) is more skeptical. He notes that farmers everywhere tend to have a different notion of what they can do with their own land than what environmentalists see as proper 'stewardship' for them. So while some gains can be made, as one approaches the suggestion of regulation or pushes very hard on farmers to change their management style -- in the name of groundwater protection and/or real stewardship -- those advocates of change risk alienating their target farm audience.

"A farmer would tell you he is a 'steward' of what lies within his fences, and the 'environment' lies beyond his fences. Whereas the environmentalist would say that the environment starts at the back door of the farmer's house; and that society has an obligation to oversee the farmer's stewardship - to the fence, and inside it. That is a very strong and very real difference."

Ken Cook (The Center for Resource Economics) believes Iowa succeeds because it has a system that delivers to farmers. "Iowa has an infrastructure and an ethic of public involvement in agriculture resource problems that you don't find in other states. Where else would you have fertilizer dealers, for God's sake, testing a nitrogen test which will cost them 30% of their business?"

Julie Elfving (Regional Nonpoint Source Program Coordinator at USEPA Region VII) has no doubt that people in Iowa have special attitudes towards farmers and the land, which they translate into their program activities. She sees them as being closer to the farmers they serve, literally, with most of them only one generation removed from the farm. But at the base of what went on in Iowa, Elfving said, is that the key participants chose to take on voluntary roles as facilitators, not coordinators. This is a position which other states may have to create, if persons will not or cannot fill this role in their nonpoint source programs.

"Anyone can be a coordinator," she explained. "But not everybody can be a facilitator. If you look at the Geological Survey when all of this began, it was a neutral agency, with no hidden agenda. Hoyer and Hallberg

were facilitators for the project, and then Gerry Miller and Jim Gulliford. What is important is that a facilitator is someone who knows how to put people together and understands the chemistry. Where you put the facilitator position is also going to be critical."

"You need someone with impeccable credentials who can reach people," *Cook* added. "Hallberg has a lot of credibility. (Former State Representative Paul) Johnson does too. Every environmental community has potential leaders who could act as bridges to farmers. It is cultivating that core group of leaders, using the cadre approach - building connections, providing support, getting money to the right people who are willing to take some chances.

"I can think of many examples where I have come across a bureaucrat who was willing to get a program up and running and it looked really good. They understood the program better than anyone because they invented it - but they couldn't create the politics to make it happen. Those people need to be found and helped. I can think of many examples of people who were willing to take a stand and yet didn't know how, because politics was outside their specialty. Someone once said a technician is a person who knows everything in their field except its place in the world. God give these programs someone who does understand it, and the politics, so they don't have to do it themselves."

GROWING PAINS IN IOWA

When Bernie Hoyer (Iowa Geological Survey, now IDNR) thinks about the early Karst and Consortium meetings, he traces most of the problems Iowa has had with public perceptions and legislative compromises, to a lack of understanding of what the initiative was trying to do, "because they (opponents) would have been educated along the way. But there just wasn't the same amount of time to make everyone knowledgeable," Hoyer said.

Steve Padgitt (Iowa State University) noted that the restructuring of critical state agencies, plus an overhaul of ISU's agricultural programs, affected the cohesiveness of the groundwater strategy. "When the state government went through restructuring, it appeared that nothing was sacred - everyone could be vulnerable. So persons recognized that sitting back and protecting their own turf may have negative consequences. Now came legislation which was handing out incentives to folks, such as IDNR and IDALS, but to be successful, these agencies had to work with the Extension Service. And that also helped Iowa State. Rather than give it all to Iowa State, or IDALS or IDNR, a situation was created where everyone wins or everyone fails. There may be a bit of genius in that."

The restructuring of IDALS and IDNR was necessary to save money. Iowa State also felt the pinch, especially through its Federal connections. Jerry DeWitt said that at the time when these innovative approaches were beginning to gel, some of the most promising extension agents were lost.

"In the mid-80s, when we began to downsize Extension, we had an immediate loss of some good people. They went to private industry, some went to other federal agencies. We lost 60 FTEs. Those who remained were asked to do more and more - that is still our mentality. We don't like to say no, and that is our biggest detriment right now."

In April 1990 several Iowans involved with aspects of the groundwater program attended the North Central Water Quality Conference, held in St. Louis, Missouri. The conference focused on state initiatives for groundwater protection, particularly in the NPS area of agricultural practices. Mike Duffy of Iowa State University invited the Iowa participants to send him their thoughts about the conference. In a memo which Duffy compiled, he noted that he was personally fearful that water quality and sustainable agriculture were drifting apart as issues, and would be treated separately in the future. "All agricultural research should be concerned with its profitability, acceptability, social justification and environmental impact," he concluded.

SIDEBAR: THE AGENT'S VIEW

In March of 1990, *Jim Hosch* of Clayton County Extension wrote on the ways in which his job had been affected by the presence of the BSBDP. Here is his "*An Assessment - The Clayton County Experience.*"

The BSBDP has emerged over nearly 10 years, so county staff and local people have adjusted slowly, remained flexible, grown with the project. We have had the luxury of building support for this project at a time before water quality problems were addressed by the public with such vigor.

1. **Part of the Total Program** - The BSBDP is considered part of a total educational program conducted by ISU Extension/Clayton Co. We try hard to market it as such, and not segregate or isolate it from the entire educational effort. Project focus is water quality. We endeavor to incorporate BSB information into all aspects of the program.
2. **Office Limitations** - During 1989 there were twenty-four people employed in varying degrees at ISU Extension/Clayton Co. Fourteen were directly associated with the BSBDP ranging from full time to hourly employees hired for a short-term task. Our office facility is not designed for a staff of this size so a fair amount of creativity needed to be expended to house the staff. In dealing with this problem, I feel strongly that the facility should not be a limiting factor in getting done what needs to be done.
3. **Budget Constraints** - For the most part, the project funding takes care of all expenses associated with the BSB project. However, the hidden costs are there, and local funding sources are stretched. Prioritizing budget expenditures tends to be most challenging. However, the Extension Council and other county staff have a commitment to the BSBDP. I do not want a situation where strict expense designation needs to occur on incidentals.
4. **Cooperative Project** - One strength of the BSBDP is that it started, and continues to be, a cooperative effort between a number of government agencies and private groups. It is an example of partnerships in issue programming. While this is a strength, it is also a frustration at times. For example, it is tough to mesh all of the facets of the project together when so many people are involved.
5. **Coordinator is a Key Component** - The BSBDP would not have either the impact or scope it does without a dedicated site coordinator. We are fortunate to have a person with experience, expertise, and willingness to attend to detail who was part of the project from its conception. Having the site coordinator responsible to ISU Extension is a real advantage.
6. **Communications** -- It was obvious early in the project that there was a tremendous desire from the media to have information on the BSBDP. That need along with a need to share project information and recommendations with local cooperators resulted in funding and hiring a communication specialist. It was a wise decision. Now we deal with all communications (media, newsletters, displays, follow-up, visuals, tours, etc.) in a more professional manner.

7. **Support** -- At the local level we don't deal directly with initiating funding for the project, but we do spend considerable time and effort building support for the BSBDP. Reports are a "way of life," but much of support enhancement has been on-site tours showing people what is occurring in the project. In 1989, twenty-four groups involving 544 people toured the BSBDP.
8. **Diversity of Education & Research** - Another strength of the BSBDP is the number and diversity of research projects and educational activities. All deal with the overall goal of studying agriculture's impact on water quality, but each aspect does have it's own identity. Funding sources have mandated some of the activity, but we have been able to expand the scope of the project into areas with practicality and with special interest to local producers.
9. **The "Political Arena"** - The uniqueness of the BSBDP has caused it to be cited in various discussion formats over a number of years. While there is a degree of sensitivity and caution in this area, the local people involved with the project have been thrown into "political arenas" of various types. For the most part this involvement has been challenging and worthwhile.
10. **"Added Effect" of Education** - While much education occurs from direct teaching by ISU Extension staff, we rely more and more on the information being generated by others. We've had concentrated efforts to involve agricultural industry personnel, teachers, and special interest groups. We have concentrated on self-guided tours of plots, developing hand out materials, displays, etc.

Ten years ago when the BSBDP started I did not envision it to be like it is today. Locally we've strived to deal with the biases and barriers that could have hampered the project. We've not been as successful as we need to be in "letting go" of programs that aren't in stride with major program objectives. However, the project has tremendous support from local people and has helped us focus on a major issue."

The conference provided the Iowans with an immediate means to compare Iowa's program with that of surrounding states. Many of the responses Duffy received show this reflection. Stu Melvin, of ISU's Extension Agricultural Engineering, and Harold Stockdale, an Extension Entomologist with the State IPM program, offered these comparisons. First Melvin:

"Another impression from the meeting was that some of our neighboring states have identified a wider range of water quality problems in their programs than we have in Iowa. Until recently, there has been little effort placed in farmstead water quality in Iowa, whereas this is the first priority in many states."

Stockdale wrote: "As I listened to the talks, I thought that there was a need (on central staff) to know more completely what kinds of research were being conducted in other departments and on the cooperative farmers with a link to ISU. Is there a need for an ISU water quality conference to make us aware of what research is actually planned/or in progress?"

Since those remarks, there has been a reunion of the old and new participants in water quality, held in Des Moines November 8, 1991. It was an opportunity for people to see the full range of what was being done by others in the state. The meeting was attended by so many people who were reporting on their diverse

activities, that there was virtually no time to reflect on larger issues, such as the underlying goals of the state's groundwater efforts. The Consortium's own Big Spring Basin Demonstration Project, Integrated Farm Management Demonstration Project, and Model Farms Demonstration Project, are but bright stars in an entire galaxy of strategies that include the following:

- Hydrologic Unit Area projects (SCS administered)
- Water Quality Demonstration Projects (federal/state Extension administered)
- Agricultural Conservation Program (ACP) Water Quality Special Projects (ASCS administered)
- PL-566 (limited to small watersheds, SCS administered)
- Conservation Reserve Program (USDA)
- Water Quality Incentive Projects (USDA)
- EPA 319 - Nonpoint Source Program (USEPA and IDNR)
- Clean Lakes Program (pollution-damaged public lakes; USEPA and IDNR)
- Iowa Publicly-Owned Lakes Program (IDNR)
- REAP Water Protection Fund (IDALS-DSC)
- Sinkholes Projects (IDALS-DSC)
- Leopold Center Projects
- New USGS monitoring initiatives, related to agriculture

And others! The event was largely devoted to report giving. In one sense it was impressive. The growing list of new state and federal initiatives was recognition of the need for what Iowa and the Consortium had undertaken -- a faltering measure of success. Clearly everyone was busy, engaged, and moving the state ahead toward its environmental goals. On another level, the sheer size of the group prevented it from acting out that vital earlier role as consensus building forum. Hallberg said that he and others felt the original spirit of the Karst Committee had to be revived after the meeting, in halls, and around the edges of such a meeting.

SECTION VI. EPILOGUE

Overview

Iowa's 'Teachable Moment' arrived with some sobering conditions. There were widespread farm failures and growing public awareness of agricultural contamination of the environment. At first glance, a person might think that the plight of farmers would provoke in the general population more tolerance of environmentally-harmful practices. Farmers are necessary for our survival -- therefore this is the price to be paid. And in fact that line of thinking has been used both within and outside the farm sector ever since the so-called Green Revolution began. But this time the momentum took a slightly altered form. Farmers themselves questioned the price they had paid and were paying to maintain their high input, high output subsidized and specialized operations. Nonfarmers, exposed to more information than usual about agricultural policy during the farm shakeouts, also saw the obvious: that policy was causing farmers to do things which were harmful to themselves and the environment, and that taxpayers were being asked to pay more for farmers to continue their ways.

In Northeast Iowa, farmers were proud of their community and also disturbed by impacts on their health and that of their families. But as the Big Spring Basin project showed, having farmers who are open to new approaches is only the initial step. There still needs to be effective changes for those farmers to adopt.

The teachable moment still required the right '*curriculum*' --and the right *educators*. To deliver those kind of changes to farmers, the institutional structures of the state had to be encouraged to produce the right innovations. Institutions also had to go through their own teachable moment simultaneous with reaching out to farmers. The value of the Karst Committee is that it allowed a neutral place where everyone could admit deficiencies and explore change -- without the risk of contradicting 'official' agency policy. They were also aided to think more holistically and in ways which went beyond their prescribed role as regulators, researchers, or educators.

INGREDIENTS

The major ingredients that contributed to the evolution of the Iowa's innovative program were:

THE CLIMATE FOR CHANGE

The opportunity to develop something of importance in groundwater policy in Iowa came about because of special conditions in Eastern Iowa. The 103-square mile Big Spring Basin watershed has special hydrology which could be monitored effectively and cheaply by the Iowa Geological Survey.

Secondly, the immediate target audience of those changed perceptions was a workably-sized group. There were slightly more than 200 farm families in the Basin. These people were enrolled as partners in the program. They tested the new farming techniques, and they also acted as a focus group for marketing strategies.

The agencies and institutions which served agriculture, as well as those overseeing environmental quality, were also undergoing transitions. Inevitably, the new information which showed that agrichemicals do pose a widespread threat to groundwater meant that the advice which farmers had received on application of those chemicals included errors. In particular, it appeared that agrichemicals contaminated groundwater supplies even with recommended rates, and by moving through the soil profile more readily than was previously believed. This discovery obliged many agricultural scientists to re-evaluate their position.

"I have to credit the remarkable open-mindedness among Iowa State's agricultural leadership and administration -- particularly John Pesek," remembers Hallberg. "They didn't throw us out or cut us off.

Probably that was because they knew us from past associations. But they were also big enough to go to their own people and ask them -- is this right? And the young leadership at Iowa State was saying, 'Yes, it is real'. They were good enough scientists to see that there was a rationale here. Then they stayed out of it, instead of squashing it -- as has happened at some other leading agricultural schools."

ENABLING EVENTS

A sequence of events going back to the early '70s preceded the formation of the Karst Committee, calling for collaborations between future participants. There were the cooperative soil survey program, the irrigation feasibility studies conducted in the mid-70s in Western Iowa, and the Area-wide Water Quality Planning requirements of S208 which were also done in the 1970s, which required agencies to think in terms of natural watersheds, rather than with artificial geographic districts of state jurisdiction. Conservancy districts were part of this new planning, which brought fresh faces and new agenda to debates on water quality, allowing state agents to see that farmers wanted the right solutions to solve groundwater problems.

THE SET OF CIRCUMSTANCES

To attain each new stage has required enabling conditions to move it ahead. The circumstances that brought about the Karst Committee and then Consortium also had to exist for passage of the Groundwater Protection Act in 1987. The latter conditions included:

-The presence of legislators with vision and the technical abilities to defend the groundwater strategy as it moved towards becoming groundwater law. These lawmakers were often matched against lobbyists who were the best in their profession. They also had to consider the danger of their position on their political career in an agricultural state.

-A somewhat confusing national policy climate which was committed to action on nonpoint source groundwater protection, but which experienced numerous setbacks. Tremendous numbers of position statements, working drafts, conferences and white papers were generated within and outside government. What was viewed as confusing by some states, was also seen as fodder by more enterprising state personnel. Also, it became clear to the Iowa lawmakers that they would have to build their own program. The big federal grant never came. The only criticism which could be leveled against the legislators is that they failed to provide a more permanent source of funding for these large agricultural-education initiatives in the package which they created. The special oil overcharge funds were a one-shot proposition. The bulk of continuing funds went to other programs.

-The growth of groundwater contamination as an issue in the mind of the Iowa public and nationally as well. This provided a mandate for officials, researchers and legislators. It also brought stress, as they were obliged to come up with solutions because people were watching.

-The Greening of Iowa's media. In Iowa there was a good pacing of information which appeared in the press, with a combination of data and information on what needed to be done to correct the problem. During the critical legislative debates in 1987, the media strongly supported the bill. Then, following its passage, the media has continually updated the progress of various Groundwater Protection Act programs, including legislative or agency back-sliding on deadlines, standards or funding.

-The integration of a sustainability ethic into mainstream farming. The work of Practical Farmers of Iowa, Iowa Natural Heritage Foundation, the Aldo Leopold Center and other sources, brought a reasonableness and balance to more sustainable farm practices.

-There has been a concurrent movement in Iowa promoting the preservation ethic that has affected the state's wetlands, prairies and other wild areas. On the one hand, the preservation/restoration movement has involved farmsteads in some creative environmental programs. On the other hand, funds which may have gone to groundwater protection and demonstration farms in past years are now going to preservation projects.

-The increasing involvement by the nonfarm sector in the affairs of farmers. Not only has the public developed more critical attitudes on such things as price supports, soil erosion and agrichemical contamination; but there is now involvement by animal rightists in farm practices, a growing number of nuisance suits filed by nonfarmers (and even by other farmers) living in rural areas; and now 'turf' battles between farmers and conservationists over wetlands and other plots of ground and their fate.

-The Greening of Iowa State. Perhaps it should be termed the 'Writhing of Iowa State'. It was not easy for one of the country's leading agricultural centers to reorder their priorities. Fortunately, integrated farm management is closely tied to profitability and environmental protection, which has given agriculturalists a sensible alternative to maximum production, which they could adopt.

-Hard times on the farm. It also helped with attitude changes that Iowa faced a very real and immediate crisis within its farm population, which was directly linked to the above-mentioned question of production-based thinking. With maximum production as a model, farms racked up great debts, which lead to their demise. The artificiality of agricultural economics became almost surreal in the early 1980s, as land values soared, then fell, interest rates climbed for implements, and as earnings per unit of land evaporated.

The new approach allowed for a smaller scale of operation, less inputs, more resourcefulness -- while benefiting the environment. Endorsing these policies through the new demonstration farms and research as ordered in the 1987 Groundwater Protection Act, was made more politically acceptable because of these macroeconomic trends.

A TRUE WORKING GROUP

Participants for the most part knew each other before coming together, and had often collaborated on related projects in the past. They also sustained a series of projects and tasks which had to be completed before the next meeting. The workload of the group determined the meeting times-- they did not meet for the sake of meeting. Beyond that, this was a group of people who were actively involved in executing the work of their agencies. They were not there as representatives of their organization, but as persons who had to make policy work within their organizations. They also acknowledged that they were meeting within a new context to carry out work which included completely new constructions. Often, they realized they were literally creating work for themselves by being part of this effort.

FLEXIBILITY

Groundwater protection was a new issue to most of the participants, though some of the agencies had started to study this problem. This void of background forced the group to be flexible. Everyone started from the same general point of having very little policy in place that was threatened by what the Committee said or did. None of them could hide behind traditions or well-established agency policy. In fact, one of the first things the participants did was to agree that overall groundwater policy and protection were negotiable, and then to begin reassigning who did what.

PROCESS

After roles were identified, the group spent several working sessions perfecting the process for attacking the problem. Many groups which meet to solve a large problem like the one faced by the Karst Committee would

dispense with the notion of process almost immediately, or delegate to one member the job of creating a rubric which could be attacked and criticized by all other members. That did not happen here. In fact, exploring the process also meant that participants had to confront what was important in terms of priorities, former agency policy, the ultimate client and the notion of cooperation. And because they deliberated on the process, they had from the outset the mechanism for addressing large issues, for forming coalitions and for putting together unified proposals. In fact, using the process, significant funds were delivered to other projects before Big Spring got its fair share.

DIALOGUE AND CROSS-POLLINATION

Working outside an official context where caution and turf protection would have been the over-riding consideration, this organization was able to have true debates on the issue. The attitude of participants was respectful of the opinions of everyone, but there was freedom to challenge and offer differing views. Participants felt a certain protection within the Committee. That kind of protection is important to any consortium which is thinking seriously about an innovative approach to a sensitive environmental problem or other issues.

EMPOWERMENT

The backgrounds of the Committee leaders helped them to identify persons who could have an impact on the overall program when they were brought into the group. Those people were nurtured by helping them to seek funding, and they were encouraged to be innovative in their projects. This is true of the inner group of the Karst Committee, and it is also true of the wider circle of persons who were recruited by participants to take on aspects of the overall work. Many of these second level participants are now the most important persons, in the sense that they were given the chance to throw themselves into very special projects and they responded with enthusiasm and results.

EVOLUTION

Evolution is inherently dangerous to a group, because the original intent of the group can be diluted or disappear completely with program evolution. But evolution is also necessary for a group like the Consortium because it acknowledges the talents and needs of those who participate. Evolution also takes into account changes in society, particularly that of the target audience. Finally, evolution can allow a group to maintain its original objectives by approaching the same issue in the differing ways which are now required to keep the program effective. In Iowa, all of these effects were present. The final verdict is still out on the end product of evolution.

PUTTING IT IN A VEHICLE

These ingredients and personalities -- the catalysts of the chemistry -- had to be blended and put into a vehicle that could carry them forward together. The Iowa vehicle had to be large enough to carry the comprehensive range of agencies and their agendas. The vehicle also had to be able to molt as the program moved to implementation and augmentation. It had to be a vehicle which got the most out of its passenger/participants.

PASSENGERS

Anyone who has taken a family vacation knows that there are good travelers and bad travelers. In the family, you sometimes have to bring both. So it was with the Karst Committee. But like any successful

family, so the Karst Committee found ways to handle squabbles, the sullen, the disruptive or mutinous passengers.

The majority of the passengers were cooperative and knew their roles. In the vehicle you found visionaries, realists, skeptics, and champions of end-users. Any talented group of people will create a certain number of roles to match the needs of the situation. But it should not be assumed that the right people will always be there. For that reason, it is useful to identify the key roles in the Iowa model. They will probably be important in other states and other kinds of similar committees:

+**The visionary** who sees the immediate project within the larger context in time and space, someone who relates the group's work to larger concepts and models, including state and federal projects and policies; and mindful of what resources can be brought together to accomplish more than the sum of the group's parts.

+**An internal facilitator** who is willing to work behind the scenes to make sure everyone understands what is going on, who moves people towards a working consensus.

+**The external facilitator** who has strong links between State agencies and the national rubric of allied experts or interested parties. This person is good at bringing people together to create partnerships which yield novel results.

+**The pragmatist** who brings order to novel thinking and electric discussions.

+**The dedicated administrator**, who sees that memos are sent, minutes taken, and steps followed to reach consensus.

+**The local conscience**; a practioner who does not lose touch of the fact that they have gathered for an express purpose and to serve a particular group of clients.

+**Neutral moderators** who are fair and respectful of all opinions and who entertains no hidden agendas nor has one of their own.

+**Innovators** within agencies who are ready to break out of their prescribed departmental roles, so long as they have the backing of the group. They accept personal risk, even to their careers, to follow their instincts, to do what is right for Iowa.

+**The documentarian** who translates the group into a publishable form -- minutes and memos -- which can be understood by a broad audience. This is not a media person, but a group member. Later, cheerleaders from the media can be added.

+**Persons of conscience** who intensely defend their beliefs, but who have the integrity to accept adjustments to their thinking when it is needed. They fuel the debates by always requiring better answers before they accept compromise.

+**Fellow travelers** among federal agents who hop aboard at times, or fill the gas tank or at least chip in for a few gallons, and help map the course.

+**The loyal opposition**. These may be agency people whose 'old approach' broadens debates and helps shape the needed transitions. It also includes devil advocates who are skeptical of the science or philosophy espoused by the group.

It must be pointed out that unlike the family car model, in the case of the Karst Committee the drivers occasionally changed; and many of the original passengers invited dozens and hundreds of other riders on board. As the car became a train, with compartments and entire train cars of participants, it became increasingly hard to rely on the original chemistry and goals of the group to maintain its forward progress.

YA GOTTA WANNA

According to Hallberg, before anyone sits down to deal, three things need to be expressly or implicitly understood about the task at hand:

1) *You must pay the price for cooperation.* Interagency coordination consumes vast amounts of time and energy. There has to be a nucleus of persons who agree among themselves to accept that burden, even if it means doing things which ought to be done by the others -- such as grant writing, networking, delivering talks to colleagues of fellow participants in their behalf, modeling projects which should be done by others and making it easier on some participants until they get properly oriented and self-sufficient in representing their agency.

2) *You must agree to disagree.* A broad issue like nonpoint source contamination of groundwater by agricultural chemicals is destined to provoke differing opinions. Not everyone is going to agree on every definition or priority. But basic consensus on program directions must be reached.

3) *You must put aside both agency and personal egos.* It is inevitable that situations will arise where, in the public view, one agency that is most clearly linked to a project will get credit for it at the time of success -- rather than other agencies which have worked on the project all along. It may be wise for group participants to pass off credit to cooperators or others who have been associated with the process. That is one of the powers which the group has to give. Credit and rewards are things which need to be examined up front, so that there is not burnout and resentments later on. It must be a team effort.

Hallberg recommends other steps needed in establishing your group's program:

- *Identify the right people
- *Create a framework for all participants
- *Implement through local programs
- *Identify cooperators for the local programs
- *Listen and learn -- bottom up listening
- *Market the information properly

FLIES IN THE OINTMENT

It is clear that several of the transitions in Iowa have endured growing pains and setbacks. The Iowa Groundwater Protection Act continues to be challenged each legislative session with amendments to the original programs. There has also been a series of deappropriations of environmental funds which is part of the general belt-tightening that has gone on in the state. The sunset of some of the most innovative programs -- the IFMDP, the MFDP, and even the Big Spring Basin Demonstration Program itself -- has also been reached. These programs were not included in the dedicated funding provided in the Groundwater Protection Act; they only received special, one-time funding for 5 to 7 years. At this writing, no large-scale statewide program has

been introduced in the General Assembly to maintain these efforts. Iowa's water-quality team are now working within several national programs, to keep the innovations propagating.

There were other reasons why momentum may be lost over time in Iowa. The simple fact is that in some ways Iowa has been too creative. The innovative programs that came along, many of them as significant as the GPA, also drew on limited resources. There was competition for the relatively limited dollars, and there was equal competition for talented persons to become involved with the growing array of programs. The dollar problem was exacerbated by legislative demands that Iowa devote more resources to economic development -- a compelling argument at a time when the state was rocked by recession. The latter condition lead at times to management at the local level by persons who quite simply did not do a good job of helping farmers to change their management practices. Finally, as with any state, Iowa had a number of farmers who need a great deal of time to decide to change their cropping practices, and these resisters must be taken into account when a program is calculating its influence on local systems.

ACCOMPLISHMENTS

The accomplishments of the collective Iowa programs -- that have become known as Iowa's Agricultural-Energy-Environmental Initiative -- have been impressive. A 1991 assessment documented that since the mid-'80s Iowa farmers have reduced their fertilizer nitrogen use -- compared to past practices and other states -- by over a Billion pounds, with no decline in yields. This has saved Iowa farmers over \$200 Million!

For impact on a more basic level, consider simply some of the record of the Big Spring Basin Demonstration Project -- often described as the granddaddy of water-quality projects. Over the past decade the Basin has been visited by over 10,000 people -- ranging from farmers to politicians; including legislative groups, national environmental leaders, industry groups, Federal agency heads. The visitors have come from 37 states and 52 foreign countries. Which has prompted the local tourism bureau to list the Big Spring in their brochures. Educational materials from the project have been used at meetings and educational displays with attendance of over 250,000. Articles and additional coverage by radio and TV stations. Stories in every major farm magazine, many ag-industry magazines, environmental magazines; EPA and USDA Journals, and myriad national newsletters. The project has been featured in several major videos by public and private groups. The BSBDP has been called the most well-designed groundwater basin study in the world and the sign of the devil on the forehead of the fertilizer industry!

There have been myriad individual awards and many group awards bestowed. Among the major group awards are the 1992 USEPA Administrator's National Award for Pollution Prevention; an Environmental Achievement Award (Model Farm Demonstration Project) from the National Environmental Awards Council; the 1990 National Program Innovation Award from the National Association of State Energy Officials.

Other feats of note:

- +The most aggressive, largest sustainable agriculture program in the country.
- +Creation of the largest sustainable agriculture research center (The Aldo Leopold Center for Sustainable Agriculture).
- +The nation's largest network of demonstration farms (as of 1991).
- +The first of its kind conservation-resource enhancement legislation to preserve and restore to Iowa some of its native environment.
- +Creative funding of environmental programs through combinations of user taxes, lottery profits and income generation with crop consultants.
- +In the spirit of the 1987 Groundwater Protection Act, the nurturing of a sustainable ethic in Iowa.

TRANSITIONS

Usually in telling "The Iowa Story" an author will focus on the dramatic moment when revelations were made at Big Spring that agrichemicals do not behave as we thought they should. A second story which has been written, less frequently, tells of Iowa's innovative Groundwater Protection Act, which has been a model for other state programs and whose conception is rather dramatic and 'a good read'. A third story, barely explored at this point, is that of Iowa's remarkable network of demonstration farms within the water quality education program.

But for persons to understand the true nature of Iowa's efforts, all these stories have to be spliced together. The results in some ways only act to underscore the remarkableness that it ever happened at all. Beyond that, the size of the task, and the way in which it had to be approached to accomplish its mission, then produces something ultimately more valuable to anyone who faces a similar task: i.e., the process by which the goal is achieved.

APPLICATION TO OTHER SITUATIONS

Does the Iowa experience have relevance for other states or federal initiatives? Obviously it does. It already has been used as a model for other state activities. It has also been a model for federal programs. But those applications take directly from the *techniques* which were developed by the consortia effort. They are derivative in nature. What is less frequently utilized is the approach taken in Iowa to address the problem -- the use of the Karst Committee/ Consortium mechanism itself. It is this approach which should be translated, and utilized not only by organizations interested in groundwater protection and sustainable agriculture, but virtually any group with limited resources and an ambitious program, and the need to nurture interagency cooperation, can benefit from utilizing the approach taken in Iowa.

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