

Illinois Groundwater Protection Program

Biennial Comprehensive Status and Self-Assessment Report

January 2000

Prepared by the Interagency Coordinating Committee on Groundwater



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ACRONYM GLOSSARY

Act	Illinois Environmental Protection Act
AFRAP	Agrichemical Facility Response Action Program
BMP	Best Management Practices
BOL	Bureau of Land
BOW	Bureau of Water
CAS	Compliance Assurance Section
CDC	Centers for Disease Control and Prevention
CSGWPP	Comprehensive State Groundwater Protection Program
CWS	Community Water Supply
DNR	Department of Natural Resources
EPTF	Environmental Protection Trust Fund
GAC	Groundwater Advisory Council
GIS	Geographic Information System
GMZ	Groundwater Management Zone
HWRIC	Hazardous Waste Research and Information Center
IAWC	Illinois American Water Company
ICCG	Interagency Coordinating Committee on Groundwater
IDNS	Illinois Department of Nuclear Safety
IDOA	Illinois Department of Agriculture
IDPH	Illinois Department of Public Health
Illinois EPA	Illinois Environmental Protection Agency
IGA	Illinois Groundwater Association
IGPA	Illinois Groundwater Protection Act
IPCB	Illinois Pollution Control Board
ISGS	Illinois State Geological Survey
ISWS	Illinois State Water Survey
JCAR	Joint Committee on Administrative Rules
MCL	Maximum Contaminant Level
MHC	Minimal Hazard Certification
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
NPS	Non-Point Source
NRCS	Natural Resources Conservation Service
OSFM	Office of the State Fire Marshal
P2	Pollution Prevention
ppb	parts per billion
ppm	parts per million
PWD	Public Water District

RCRA	Resource Conservation Recovery Act
SCS	Soil Conservation Service
SDWA	Safe Drinking Water Act
SEGIP	State Environmental Goals and Indicators Project
SIU	Southern Illinois University
SMCL	Secondary Maximum Contaminant Levels
SMP	State Pesticide Management Plan
SOC	Synthetic Organic Chemical
SOP	Standard Operating Procedure
TARP	Tunnel and Reservoir Project
TCE	Trichloroethylene
UICES	University of Illinois Cooperative Extension Service
U.S. EPA	United States Environmental Protection Agency
U.S. GS	United States Geological Survey
USDA	United States Department of Agriculture
VOC	Volatile Organic Chemical
WHPP	Wellhead Protection Program

EXECUTIVE SUMMARY

The Illinois Groundwater Protection Act (“IGPA”) (P.A. 85-0863, 1987) responds to the need to manage groundwater quality by emphasizing a prevention oriented process. The IGPA is a comprehensive law which relies upon a state and local partnership. Although the IGPA is directed toward protection of groundwater as a natural and public resource, special provisions target drinking water wells. The IGPA responds to the need to protect groundwater quality and establishes a unified groundwater protection program, by:

- Setting a groundwater protection policy;
- Enhancing cooperation;
- Establishing water well protection zones;
- Providing for surveys, mapping and assessments;
- Establishing authority for recharge area protection;
- Requiring groundwater quality standards; and
- Requiring technology control regulations.

The groundwater policy sets the framework for management of groundwater as a vital resource. The law focuses upon uses of the resource and establishes statewide protection measures directed toward potable water wells. In addition, local governments and citizens are provided an opportunity to perform an important role for groundwater protection in Illinois.

Groundwater Importance: Good stewardship of our natural resources, such as groundwater is in the best interest of our state. During 1995, groundwater withdrawals averaged 953 million gallons per day (“MGD”). Safe and adequate water supplies are vital for health and necessary for local and regional economic development. Approximately 4.1 million people use groundwater as a source of public water supply in Illinois. There are approximately 5,534 groundwater dependent public water supplies in the state of which 1,195 are community water supplies. The community supplies serve about 3.1 million people. Approximately 400,000 residences of the state are served by their own private wells. In the six county area around Chicago the deep bedrock aquifer is at its level of sustained yield at 65 MGD, and withdrawals beyond this will mine the groundwater. Currently, under the Lake Michigan Allocation Act the majority of these counties are using Lake Michigan. However, the Lake Michigan allocation is at its limit. A significant future concern is that the population is projected to increase 70 -100 percent by the year 2020, and this will put an increased reliance back on shallow groundwater resources. This may also exacerbate urban sprawl. Groundwater also provides up to 80 percent of the base flow to streams in many areas of the state and is essential to watershed ecology.

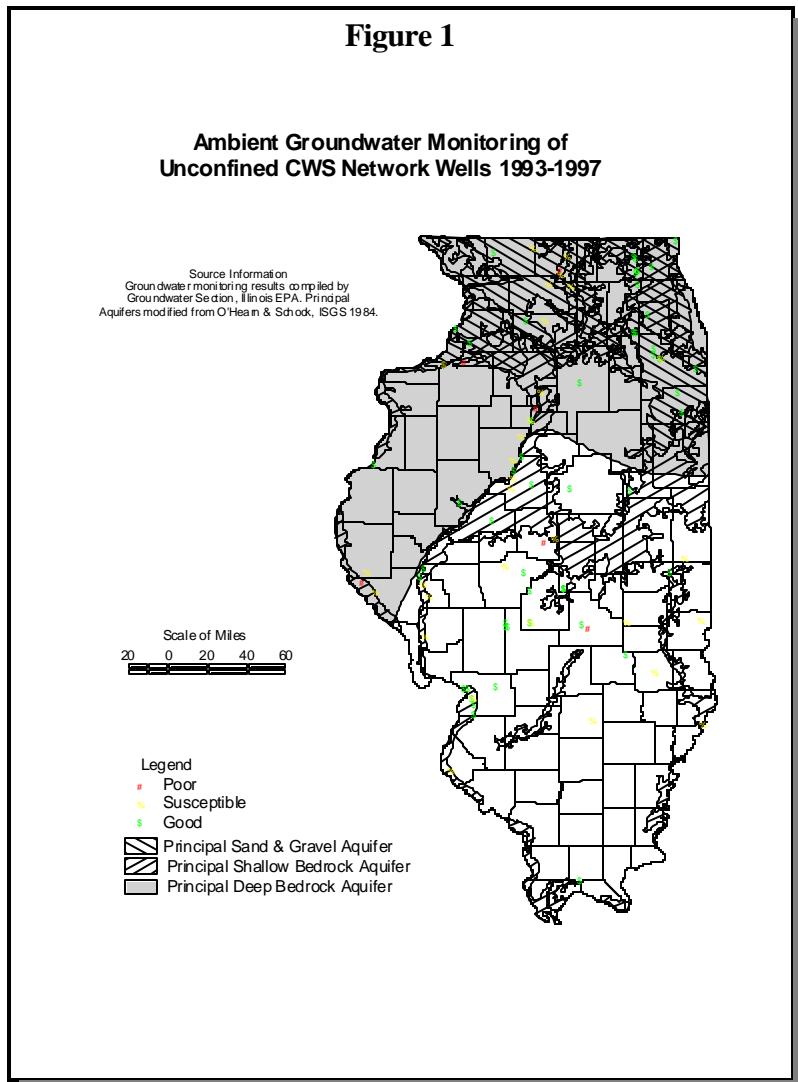
Where is it? The largest amount of groundwater withdrawals is in the northern one-third of the State where large supplies of potable water are available in aquifers that range in depth from about 10 feet to about 1,500 feet. Approximately 70 percent of community water supplies in the state withdraw water from confined aquifers that have natural geologic protection from surface and near surface activities. However the remaining 30 percent of the communities withdraw water from unconfined aquifers that are susceptible

to pollution from land use and other activities on the surface above them.

How good is the Water?

Groundwater quality is a major concern in Illinois. Water-quality degradation or contamination results from point and nonpoint sources throughout the state. In many industrialized parts of the state, including the metropolitan areas of Chicago, Rockford, and St. Louis, groundwater in aquifers in the glacial deposits and bedrock has been degraded by improperly contained or disposed chemicals. In many agricultural areas, the quality of groundwater in the underlying shallow aquifers has been degraded by the routine application of agricultural chemicals. Surface-water quality has been degraded in some areas because of the influx of contaminated groundwater.

Costs of Contamination: Illinois has spent millions of dollars on

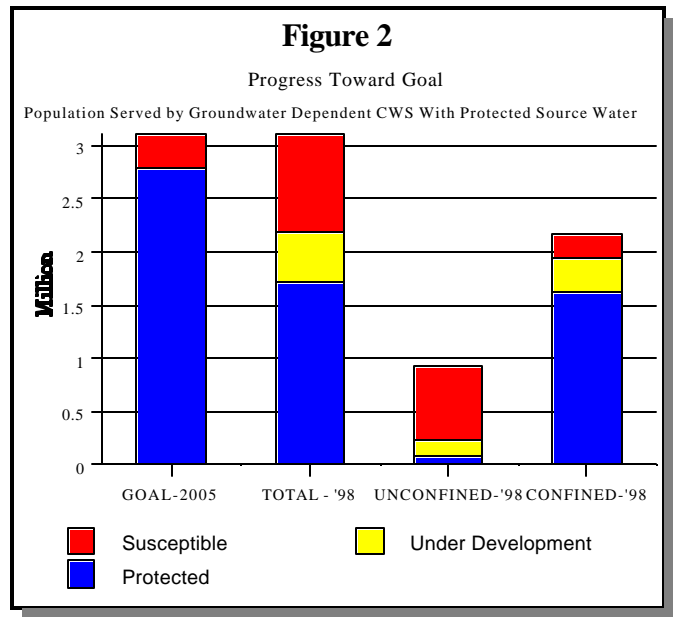


The Illinois Environmental Protection Agency ("EPA") has also evaluated some of the costs associated with contaminated groundwater in Illinois, for example:

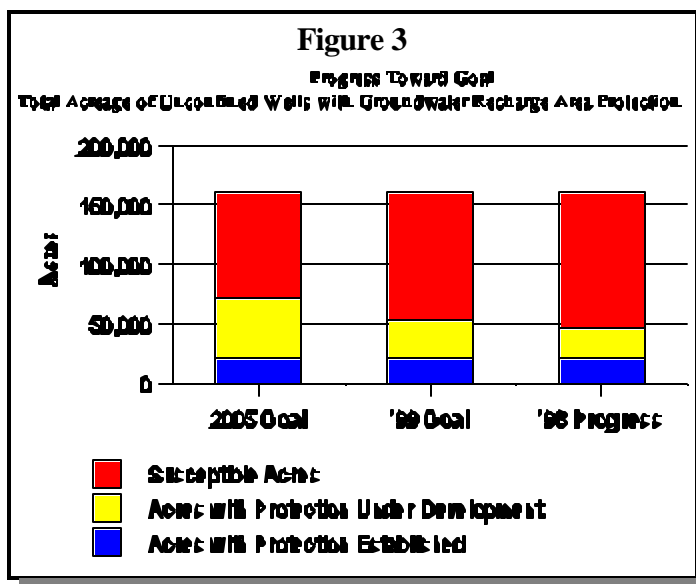
- One fourth of the city of Rockford's water needs, were permanently lost because of contamination by volatile organic chemicals ("VOCs");
- The city of Fox River Grove spent \$500K to design and install a VOC treatment system for two of their wells contaminated with VOC's;
- The city of Freeport similarly spent \$570K because of VOC contamination;
- The state provided a \$260K grant to the village of Chandlerville to find and install an alternate source of drinking water due to pesticide contamination; and
- Monroe county contains a high density sinkhole plain that is

cleaning up contaminated groundwater. Thirty five percent of community water supply wells relying on susceptible aquifers have been impacted by groundwater contamination and are rated as threatened, and poor groundwater quality. The impacted wells are shown relative to Illinois principal aquifers. A principal aquifer yields 100,000 gallons per day per square foot per 50 square mile area (70 gallons per minute).

Efforts to Protect Groundwater: Protection of Illinois' valuable groundwater resource is especially critical. The Illinois Environmental Protection Agency ("EPA") has made considerable progress in groundwater protection through such initiatives as the groundwater standards, Regional Groundwater Protection Planning Programs, and the Safe Drinking Water Act Monitoring Waiver Program. Illinois continues to address the need for protecting groundwater by accomplishing the mission set forth in the IGPA and through federal, state and local partnerships to establish groundwater protection programs. These partnerships have utilized regulatory and non-regulatory programs to achieve success. Illinois EPA is



measuring the population served by systems with protected unconfined and confined aquifer resources.



Unlike larger water supplies, small supplies may not have experts on staff to solve water quality problems or the rate base from which to draw funds for corrective measures. Therefore, protecting the resources utilized by these small water supply systems are critical.

Protecting the land surface areas around susceptible unconfined aquifer wells (recharge areas) can help prevent contamination of groundwater. Coupled with the population served, measuring the acres with protection programs under development or in place provides an effective measure of Illinois' progress in protecting these susceptible areas.

Program Summary - 1998 through 1999

Illinois has made progress in implementing groundwater protection programs by the adoption of groundwater standards, and establishing minimum setback zones. Well site survey reports have been completed, automated, and provided to the majority of the 1,195 public water supplies using groundwater in Illinois. These reports assist in generating needed information that local governments use in adopting minimum and maximum setback zone ordinances. A total of 108 community water supplies, representing 332 wells, have or are in the process of adopting maximum setback zones.

In the last two Biennial Reports, it was recommended that the Illinois EPA more fully utilize the authority provided under Section 14.3 of the Illinois Environmental Protection Act to develop and propose maximum setback zone regulations to the Illinois Pollution Control Board ("Board"). During the past two years, the Illinois EPA has been completing groundwater modeling that will support a regional maximum setback zone proposal. This modeling, and draft regulatory proposal was completed in 1999. A workshop will be held in the year 2000 to provide for stakeholder input prior to presenting a proposal to the Board.

A great deal of work needs to be done to establish additional maximum setback zones in the areas of greatest need. The Regional Groundwater Protection Planning Committees have made very good progress, and continue to receive national recognition for their efforts. The Illinois EPA received a second petition from a regional planning committee to develop a regulated recharge area in Illinois. In addition, a third petition is being discussed by one of the other regional committees. The Illinois EPA has developed a rule-making proposal to submit to the Board in late 1999 or early 2000.

As illustrated in Figures 2 and 3, there is a greater need to develop enhanced source water protection programs through voluntary efforts. By establishing local groundwater protection programs in community well recharge area(s), a community may focus its management efforts, avoid excessive management and regulation in areas that do not contribute to the wells, and avoid spending time and funds on protecting non-critical areas. This type of prevention program has allowed the state to continue to provide waivers to reduce the CWS monitoring required under the Safe Drinking Water Act ("SDWA").

The IGPA provided setback zones and surveys of potential sources and routes of contamination for CWSs. It also authorized large communities served by groundwater to conduct "groundwater protection needs assessments." A groundwater protection needs assessment defines the critical recharge area(s), identifies the existing potential contamination sources and/or potential routes located in this area, and also relates this information to the existing land use zoning. An assessment also evaluates the water supply contingency plans in the event of contamination incidents. The combination of this data will allow for the application of a balanced management plan for the protection of these groundwater resources.

From the pilot groundwater protection needs assessments that have been completed, the Illinois EPA, ISWS, and Illinois State Geological Survey ("ISGS") have developed a *Groundwater Protection Needs Assessment Guidance Document*. The IRWA and others are continuing to use this document to provide technical assistance to communities. Since the guidance has been developed several communities have utilized it to conduct comprehensive assessments.

Communities need to incorporate regional groundwater protection concerns as a key component of planning and zoning issues, since zoning is frequently a blueprint of growth. However, as described in previous reports, resources are needed in the form of financial assistance or other incentive programs from the state or federal government. These resources are needed to assist in performing groundwater protection needs assessments and to make local wellhead protection programs truly effective. The Illinois EPA has initiated work in the Central, Northern, Northeastern and Southern Priority Groundwater Protection Planning Regions to assist with performing recharge area delineations and develop protection programs. This assistance needs to continue and be expanded such that the resources available from the state are leveraged to protect these critical resource groundwaters. In addition, the resources provided under the re-authorized SDWA of 1996 for conducting source water assessments will greatly assist in the areas of need. In the long run, a local technical assistance program could lead to cost savings and economic growth for many companies and communities. The companies and the community must have an uncontaminated source of drinking water to remain economically viable. Continued and better collaboration with the Clean Break Program, and P2 technical assistance, would assist the Regional Planning Committees in advocating community based groundwater protection programs for CWSs.

1998 Through 2000 Recommendations

The recommendation contained within this section are based, in part, on input and interaction with the ICCG, GAC, Regional Groundwater Protection Planning Committees, Source Water Protection Technical and Citizens Advisory Committee, and Northeastern Illinois Planning Commission-Water Supply Task Force. Furthermore, these recommendations consider the input from Policy Forum on Regional Groundwater Protection.

The Illinois EPA will develop a proposal to amend Illinois' Groundwater Quality Standards Regulations to include a standard for Methyl Tertiary Butyl Ether (MtBE). In addition, the Illinois EPA will continue the evaluation of Class III Groundwater designation for Dedicated Nature Preserves and where appropriate propose these for listing by the Illinois Pollution Control Board ("Board"). The Illinois EPA will also develop Regulated Recharge Area proposal(s) as directed by Regional Groundwater Protection Planning Committees and prepare Maximum Setback Zone proposal(s) for Board consideration.

A generic state management plan for the protection of groundwater from agricultural chemicals should be finalized in early 2000 to encourage the voluntary protection of critical potable resource groundwaters. A draft plan has been developed for submission to the U.S. EPA for their endorsement.

Illinois EPA will continue to work with the Natural Resource Conservation Service, Soil and Water Conservation Districts, and other local stakeholders to establish conservation reserve programs for agricultural cropland located within the delineated recharge areas of CWS. A set of new county scale maps has been developed to assist with this effort. The Illinois EPA should continue to work with the Illinois Department of Agriculture ("IDA"), Illinois Association of Soil and Water Conservation

Districts, and the County Soil and Water Association Districts to implement Farm-A-Syst in targeted aquifer protection areas.

As indicated in Illinois' Environmental Partnership Agreement with the U.S. EPA, the Illinois EPA has established an environmental goal to increase the percentage of groundwater recharge areas (acres) with protection programs established or under development to 45% by the year 2005. Furthermore, 90% of the states population utilizing community water supply groundwater sources will have protection programs in place, or under development, by the year 2005.

Statewide technical assistance to communities will be expanded to include the delineation of recharge areas and conducting source inventories within these areas. Over the next 3.5 year period, more than one-hundred and fourteen CWSs using groundwater from unconfined aquifers will have their recharge areas delineated, and the potential sources of groundwater contamination will be inventoried. Coordination and technical assistance from the IRWA will also be continued to establish local teams for development of local groundwater protection programs. This will complete work for the existing wells with reasonably available data needed to do delineations. In addition, new well permit requirements will be established to implement wellhead protection prior to operation of a new CWS well.

The Illinois EPA will continue to work cooperatively with the U.S. Geological Survey to develop an Internet based geographic information system ("GIS") to provide the public with an "electronic clearing house" of groundwater assessment and protection data. Furthermore, the Regional Planning Committees may consider sharing information via the Internet. This effort could be modeled after the Homepage developed by the Central Groundwater Protection Committee.

Wellhead assessments for non-community water supply wells will be greatly expanded during the next 3.5 years, and source water assessment data for CWS and non-CWS wells will be published on the Agency's Internet homepage for greater public access. The Illinois Department of Public Health ("IDPH") will also continue to improve the design and construction techniques for potable water supply wells, based on the research findings of the Illinois Association of Groundwater Professionals.

Regional Groundwater Protection Planning Committee flexibility should be retained in establishing region specific priorities and interpreting legislative mandates. The Illinois EPA, Department of Natural Resources ("DNR") and other stakeholders should work with the Regional Groundwater Protection Planning Committees to evaluate the need for a regional aquifer assessment in Northeastern Illinois and implement protection programs in the Illinois Sink Hole Plain. The Illinois EPA should also continue its direction of assisting and providing guidance to local community officials developing groundwater protection programs.

The DNR should continue to develop and implement an aggressive groundwater education and research program. Furthermore, educational programs should be developed in the areas of: agriculture; karst; and Class III groundwater and recharge area protection programs as recommended in the Policy Forum on Regional Groundwater Protection.

BIENNIAL COMPREHENSIVE STATUS AND SELF-ASSESSMENT REPORT

INTRODUCTION AND BACKGROUND

The intended purpose of this report is three fold. First, the report is intended to provide a comprehensive status report on the implementation of the IGPA. Secondly, the report is intended to provide a self-assessment of program initiatives in relation to the goals and objectives of the program recommended in the 1998 IGPA Biennial Report. Finally, this report is intended to provide environmental and programmatic indicators to help measure and demonstrate program performance.

The current report has been organized according to the following recommended goals:

- ICCG operations;
- Groundwater Advisory Council (“GAC”) operations;
- Groundwater protection education program;
- Groundwater evaluation program;
- Groundwater quality standards and technology control regulations;
- Wellhead protection program (WHPP);
- Regional groundwater protection planning program;
- Non-community and private well program overview;
- Enhanced non-community well program initiatives; and
- Enhanced private well program initiatives.

CHAPTER I.

INTERAGENCY COORDINATION COMMITTEE ON GROUNDWATER OPERATIONS

Section 1. Continue to review and update the Implementation Plan and Regulatory Agenda

The IGPA required the creation of the Interagency Coordination Committee on Groundwater (“ICCG”). The Committee is chaired by the director of Illinois EPA or designee and has members from 10 state agencies/departments which have some jurisdiction over groundwater. The ICCG continues to review and update an Implementation Plan and Regulatory Agenda pursuant to the IGPA. The following is a list of participating agencies/departments on the Committee:

- ENVIRONMENTAL PROTECTION AGENCY - (Chair) *Roger Kanerva, designee*
- DEPARTMENT OF NATURAL RESOURCES - *Dave Baker, designee*
 - OFFICE OF WATER RESOURCES - *Gary Clark, designee*
 - OFFICE OF MINES AND MINERALS - *Dan Wheeler, designee*
- DEPARTMENT OF PUBLIC HEALTH - *Dave Antonacci, designee*
- OFFICE OF STATE FIRE MARSHAL - *Jim McCaslin*
- DEPARTMENT OF AGRICULTURE - *Warren Goetsch, designee*
- EMERGENCY MANAGEMENT AGENCY - *Jan Horton, designee*
- DEPARTMENT OF COMMERCE AND COMMUNITY AFFAIRS - *Stewart Schrodtt, designee*

- DEPARTMENT OF NUCLEAR SAFETY - *Dave Ed, designee*

Also, John R. Washburn represents the Illinois Department of Transportation's Division of Highways on the ICCG.

Section 2. Continue to hold quarterly meetings

The ICCG continues to hold quarterly meetings. The Committee has met regularly since 1988 to address groundwater protection issues.

Section 3. Provide liaison for the GAC

The ICCG has continued to assist with coordination associated with the GAC by providing Committee meeting agendas and minutes. The ICCG has also continued to review and make recommendations on groundwater research, data collection, and dissemination programs. The Committee has been successful in coordinating and assisting in many aspects of the groundwater protection program.

The ICCG, as well as, its subcommittees and work groups have helped to provide a cooperative process to develop and implement groundwater protection programs.

Section 4. Assist with development of a Fully-Integrating Comprehensive State Groundwater Protection Program vision statement and proposed Changes in U.S. EPA policies and programs in support of the vision statement

In 1993, the U.S. EPA provided the states with Final Guidance on the Comprehensive State Groundwater Protection Program ("CSGWPP"). Under this program the State has been handed the lead role in groundwater protection. The U.S. EPA guidance contained six strategic activities for two different levels of a CSGWPP. These strategies are outlined in the July 1996 Illinois Core CSGWPP Application. Implementation of at least one program is all that is required to meet the lowest or Core level criteria. A Fully-Integrating CSGWPP is then expected to be developed and influencing all groundwater protection programs in the State. A vision statement is to be developed for this Fully-Integrating CSGWPP. Also, should the vision statement bring about the need for change in the U.S. EPA policies and programs the ICCG will support and aid in efforts to make changes. The ICCG provided input on the original U.S. EPA CSGWPP Guidance and will continue in the subsequent stages of developing the Fully-Integrating CSGWPP.

Section 5. Oversee, review, and provide input to the preparation and implementation of a Pesticide Management Plan

As part of our cooperative efforts with the Illinois Department of Agriculture ("IDA"), the ICCG has agreed to provide input and assistance with the development and ultimately the implementation of a Pesticide Management Plan ("PMP"). A time line for this process has been laid out. On June 1, 1999, IDA distributed a re-draft to the ICCG. On June 16, 1999, a meeting of the ICCG Pesticide

Subcommittee convened to consider revisions to this draft. The next revision of the PMP was provided to the ICCG on July 1, 1999. On September 27, 1999, comments from the ICCG and GAC were considered by the ICCG Pesticide Subcommittee. Following the public comment period, a new draft will be issued to the ICCG. The IDA hopes to submit the PMP to U.S. EPA by early 2000.

Section 6. Review and support the annual groundwater education work plan

The ICCG's Education Subcommittee continues to actively implement statewide groundwater educational efforts and has worked with the four Groundwater Protection Planning Committees to establish local groundwater programs. The Education Subcommittee, chaired by the Illinois Department of Natural Resources ("IDNR"), has conducted a program that addresses groundwater related topics to educate the general public, business, agriculture, government, and private water supply owners, users, and operators. The ICCG reviews and provides input on the Groundwater Education Work Plan.

Section 7. Evaluate the development of Class III Special Resource Groundwater for Dedicated Nature Preserves

To date, one dedicated nature preserve ("DNP"), Parker Fen, has been designated as having Class III Special Resource Groundwater. An additional 84 DNPs are being considered for Class III designation. On September 29, 1998, Randy Locke (ISWS) gave the ICCG a presentation on the selection of proposed sites for such classification. The procedure for designating groundwater contributing to dedicated nature preserves as Class III groundwater was codified under the groundwater quality standards regulation 35 Ill. Adm. Code 620 that became effective in 1991. The ICCG has given its support to the Class III Special Resource Groundwater classification and will continue to assist in establishing more areas with Class III designation. For more information on the development of Class III Special Resource Groundwater refer to Chapter V- Section 1.

Section 8. Continue and expand the effort of providing technical assistance (CWS well recharge area delineation and P2 alternatives) to the regional groundwater protection planning Committee

The activity is reported under Chapter VI - Section 5.

American Petroleum Institute ("API") Well Numbering Agreement Between Illinois EPA, IDPH, ISGS, AND ISWS - On March 26, 1999 the Illinois EPA, ISWS, ISGS, and IDPH met to discuss the issue of using the API well number in conjunction with the existing agency well numbers. The purpose of indexing by an API well number is that it would provide consistency between various agencies and allow for universal searches and querying. The ISGS and ISWS initiated a process in October 1997 to relate the ISGS API number to the ISWS well number as current records are processed.

However, matching the ISGS and ISWS records on pre-permit wells and those permitted prior to October 1997 will be labor intensive (The process for relating geological well records with API numbers to ISWS records with IDPH permit numbers was only initiated after October 1997.). Thus, a prioritized approach should be designed and implemented to relate the ISGS, ISWS, EPA and IDPH records to the ISGS API well numbers for geological well records. Therefore, the Illinois EPA will enter into an intergovernmental agreement with the ISWS and ISGS to relate API well numbers to all existing public water supply wells as a first priority. The ISGS should refresh the Illinois EPA's ISGS Oracle database.

CHAPTER II. GROUNDWATER ADVISORY COUNCIL OPERATIONS

Section 1. Sponsor a regional policy forum in cooperation with the Regional Planning Committees, ICCG, and Illinois EPA

The objectives of the forum ranged from environmental regulations and best management practices to groundwater science and today's technology. An evaluation of current policies and appropriate measures were discussed to address important groundwater issues. The goals of the policy forum were to share experiences and approaches of the Priority Groundwater Protection Planning Committees, to discuss new groundwater issues, and develop policy directions. The idea was to approach these issues in a productive, hands-on approach.

The forum was comprised of presentations and concurrent working sessions. The morning consisted of a plenary session that addressed statewide groundwater programs and a variety of approaches in groundwater protection, while the afternoon concurrent breakout sessions focused on regulatory, agricultural and educational issues¹. Through discussion a statement of groundwater policy was the desired outcome of the forum. The following topics were addressed:

- Regional Groundwater Protection Planning Committees' Report;
- State groundwater protection program agenda;
- Groundwater management and agricultural chemicals;
- Karst Pollution Studies, groundwater and surface water interaction;
- Tazewell County "Groundwater Protection Ordinance," local government's role in groundwater protection;
- Illinois Water Well Sealing Coalition;
- Educational approaches to protecting our State's Groundwater;
- The effects of Class V Injection wells on Groundwater and Drinking water;
- Groundwater vulnerability of dedicated nature preserves; and
- Pleasant Valley Regulated Recharge Area proposal.

¹ The Illinois EPA has published a proceedings document which is available upon request, also the recommendations/outcomes of the Regional Groundwater Protection Policy Forum have been included in Chapter XI of this report.

Section 2. Conduct policy related meetings

The GAC conducted several policy related meetings over the past two years. The GAC is composed of nine members that represent public, industrial, and local governments. The IGPA mandates that the Council Members are appointed by the governor to serve three year terms. The current members are as follows:

- *Bill Compton (Chair), Caterpillar*
- *Duane Cole, Northern Illinois Water Corp.*
- *Robert Jones, Business and Professional People for the Public Interest*
- *Dr. Harold Reetz, Potash and Phosphate Institute*
- *Paul McNamara, City of Edwardsville*
- *Robert J. Millar, Sunstrand*
- *Fred W. Walker, South Central Illinois Regional Planning and Development Commission*
- *John D. Liberg, Illinois Association of Groundwater Professionals*
- *Robert C. Kohlase, Farnsworth and Wylie*

Section 3. Provide input to programs, plans, regulatory proposal, and reports as appropriate

The GAC provided input on the new Tiered Approach to Cleanup Objectives and Brownfield regulations. Also, the Council is active in supporting the Regional Groundwater Protection and Planning Committee Policy Forum. In cooperation with the ICCG, the GAC reviewed the CSGWPP, and PMP.

CHAPTER III. EDUCATION PROGRAM FOR GROUNDWATER PROTECTION

Section 1. Coordinate and conduct a statewide education program with an annual evaluation and work plan involving local, regional and state organizations and agencies. Emphasize the integration of groundwater protection into state and local agency programs.

This program has experienced measured success despite serious challenges during this two year period. Its achievements are based on several factors.

- It is designed to be a cross-disciplinary, cross-jurisdictional, cross-agency, and integrated with other elements of the groundwater protection program.
- An annual work plan is developed after careful evaluation and planning by representatives of several agencies and associations. More detailed evaluations were conducted in 1995 and 1999 involving questionnaires and feedback from selected clients representing designated audiences of the work plan. The work plans sections deal with the general public, private well-owners, public officials and water professionals, the business community, and Illinois teachers.
- Widespread participation of a variety of agencies, organizations and volunteers is welcomed and encouraged. The following have participated in this two year period:
 - 34 professional, environmental, trade and governmental associations;

- 91 local health departments;
- 98 soil and water conservation districts;
- 8 post-secondary educational institutions;
- 10 units of state government;
- 5 units of federal government;
- 5 regional groundwater committees or coalitions and their educational subcommittees;
- thousands of Illinois teachers;
- dozens of senior volunteers recruited through the Retired and Senior Volunteer Program;
- dozens of high school students recruited by teachers and local water authorities for canvassing neighborhoods in groundwater protection areas; and
- hundreds of local businesses and industries.
- The adaptable nature of the annual work plan allows for new educational and technical assistance initiatives with the collaboration of agencies and associations. Examples include:
 - the well disinfection and education program conducted by the Illinois Association of Groundwater Professionals (with a DNR grant);
 - the Illinois Farm-A-Syst Program developed by the Il. Department of Agriculture and soil and water conservation districts (supported by an Il. Environmental Protection Agency contract);
 - the Teaching Agricultural Safety to Kids(TASK) program initiated by the Illinois Easter Seal Society and Illinois FFA Foundation (supported by a U.S. EPA grant),
 - the Illinois Middle School groundwater Education Project developed by Southern Illinois University at Edwardsville, regional groundwater committees, and DNR (supported initially by the W.K. Kellogg Foundation and later by regional committees, regional education offices, and local sponsors);
 - the Groundwater Technical Assistance Program for water departments developed by the Illinois Rural Water Association (funded by Il. and US EPA); and
 - the Water Well Continuing Education Initiative conducted by the Illinois Association of Groundwater Professionals in cooperation with the Il. Department of Public Health.
- The IGPA provides a sound framework for cooperation and coordination across agency and disciplinary boundaries. The ICCG, GAC, and especially the regional groundwater protection committees provide a sound mechanism for identifying and implementing educational programs.
- Continued media coverage of water quality problems and cleanups helps keep groundwater protection in the public eye. Genuine concern about groundwater quality is especially exhibited by private well owners, such as at Water Well Clinics conducted at the Illinois State Fair or local fairs or expos.

Difficult challenges to conducting and coordinating this statewide groundwater education program can be overcome by improved policies and concentrated special efforts. Program challenges unique to groundwater education include the following:

- Educational inertia is difficult to overcome. Many textbooks and training manuals still consider only the surface water part of the hydrologic cycle. Despite the fact that the great majority of Illinois

rainfall infiltrates the ground rather than running off, most water cycle descriptions strongly emphasize the runoff, surface water, evaporation, and precipitation elements as a simple water cycle. Teacher training rarely considers the hidden groundwater part of the water cycle. Despite strong efforts to improve the teaching of the whole water cycle to the 20% of Illinois' population that are students, the remaining 80% have had little or no exposure to groundwater in their schooling.

- Institutional inertia is also present. Several agency programs deal with narrow elements of the water cycle, which encourages shortsighted understanding of water's many pathways in and around the earth. Recent studies by the DNR Office of Water Resources wisely created easily understood hydrologic budgets for areas of concern such as the Havana Lowlands and the American Bottoms. The 1999 US Geological Survey Circular 1139, Groundwater and Surface Water: A Single Resource, builds a firm scientific base for integrating ground and surface water management policies and practices.
- It is difficult to show or depict groundwater. Out-of-sight resources tend to be disregarded or glossed over in the mass media. If a movie or TV cameraman cannot videotape groundwater or a visual depiction of its movement, the general public seems unlikely to visualize it or understand and appreciate various protection strategies. Groundwater does not fit traditional media sound or video bytes! The groundwater flow models such as those built and marketed by Southern Illinois University at Edwardsville, are the best available tools to help agency staff and teachers teach about and students learn about groundwater. Close to 500 groundwater models have been placed in Illinois schools and county-level offices, but there are 5,600 learning centers in Illinois, so most schools have neither direct access to a model, nor teachers trained in its use. One goal of the education program is to secure sufficient support to place a groundwater flow model in every public and private Illinois school and to train teachers in its use. Other groundwater teaching tools need to be developed, such as groundwater computer games, a video showing scientific groundwater studies juxtaposed with the groundwater model to bridge real investigations with classroom model demonstrations, and four-dimensional holographic images of groundwater moving through the earth.
- Media coverage and movies tend to skip over groundwater science. A recent example is seen in the non-fiction book and movie, A Civil Action, based on a trial relating to groundwater contamination in Woburn, Massachusetts. The movie, in particular, did nothing to help the viewer understand groundwater science, toxicology, and epidemiology on which the court case was based, rather it concentrated on excesses of attorneys and judges. Years of groundwater and other scientific investigations were totally left out of the story, despite their central role in the establishment of facts about the contamination of some of Woburn's wells and resulting cases of leukemia. These elements were covered slightly in the book version, but again it did little to build understanding or confidence in the complex sciences involved. The actual attorneys involved in this case have since advocated an improved system of gathering scientifically based information in a non-confrontational manner prior to a trial, but again, this does not make best-selling books or movies.
- Groundwater issues and policies are complex. Groundwater systems are difficult to understand and open to different interpretations of data. As more is learned, the more difficult is the job to

educate. Many water contaminants are difficult to pronounce, are regulated in the parts-per-billion level, and are not detected by human senses at these levels. Drinking water standards are based on complex toxicological, epidemiological and animal studies. Groundwater protection is largely a land use control program and it crosses many jurisdictions and political boundaries. Groundwater laws are complex and written in, what seems at times, to be incomprehensible prose.

- The groundwater education program lacks a defined budget. The initial allocation of funding under the Illinois Groundwater Protection was reduced to the point where it does not even cover salaries, and then project funds from the Environmental Protection Trust Fund (EPTF) were allocated to other purposes. To date, about \$950,000 has been raised from various private and public sources for groundwater education services and materials, but the constant search for funding detracts from the possible achievements. Although a great deal can be built into existing programs, match funding and seed money would be very useful in securing additional funding. For example, since the five years of W.K. Kellogg Foundation funding for the Illinois Middle School Groundwater Project expired, only one or two counties' needs have been addressed annually rather than four or more per year when there was funding. Rather than efficiently implementing this program, staff must constantly work on securing funding. Another example lies in the water well sealing demonstration program which was funded with \$30,000 of EPTF funds over three years. Over 90 county-based well sealing demonstrations were conducted. Although there is a concerted demand for continuing and expanding this program, local staff need to develop local government and business donations to implement education about a state law. Jasper County developed its own well sealing demonstration fund, but that funding also expired.

Section 2. Support regional groundwater protection committees with special education programs based on regional needs. Increase emphasis on community programs for wellhead protection;

In this two year period, state agencies have supported four priority groundwater protection planning committees with a variety of educational support for their identified regional needs. There have been five groundwater protection field days, numerous FarmAsyst/HomeACRE training workshops, several training sessions for door-to-door canvassers in community capture zones, and exhibits at many fairs, expos, and field events. The Illinois Middle School Groundwater Education Project has trained hundreds of teachers and tens of thousands of students in these four areas

Since the cooperative program between IDOT and Illinois EPA was established to post road signs for community well recharge areas, the general traveling public has been exposed to WATER SUPPLY PROTECTION AREA messages. The need for accompanying community education was addressed by providing a packet of information and suggestions for communities with state signage. Six of these communities have been featured as Shining Star Communities at the annual meeting of the Illinois Municipal League and in its monthly Review, magazine.

Section 3. Through educational institutions and organizations, curriculum projects, and teacher workshops, integrate groundwater principles and groundwater protection into the curriculum for grades 3-12;

Since the Illinois State Board of Education adopted Illinois Learning Standards in July of 1997, this integration process has become considerably easier since there is clear direction on when various topics are taught in the schools. Specific Learning Standards which apply directly to groundwater protection education are listed below:

- Goal 11–Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems;
- Goal 12– Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences;
- Goal 13–Understand the relationships among science, technology and society in historical and contemporary contexts;
- Goal 16–Understand events, trends, individuals and movements shaping the history of Illinois, the United States and other nations: E. Understand Illinois, United states and world environmental history; and
- Goal 22–Understand principles of health promotion and the prevention and treatment of illness and injury.

Within each goal a matrix of standards and benchmarks are arranged by five levels from early elementary to high school. Since these standards cover the areas of science, social studies, and health education, there are ample opportunities for integrating the relatively new science of groundwater in various areas and working across disciplines.

Three curriculum enrichment packages are available which provide teacher tested educational activities:

- Groundwater: Illinois' Buried Treasure: Education Activity Guide. 1993 revision. Environmental Education Association of Illinois and the Department of Natural Resources. 150+ pages. This is typically distributed to 3-12 teachers at field days, as part of requested teacher packets, or through teacher in service workshops. About 500 are distributed each year.
- H₂O Below: An Activity Guide for Groundwater Study. 1996 revision. Illinois Middle School Groundwater Project, Southern Illinois University at Edwardsville, and Illinois Department of Natural Resources. 238+pages. The six chapters include water awareness, using the groundwater flow model, water pollution, protecting and conserving water, water testing and well histories, and groundwater issues. This is typically distributed to middle school to high school teachers only during full- day workshops where they build and learn to operate their own groundwater flow models. Since project funding from the W.K. Kellogg Foundation has expired and only locally generated funds support this project, the number distributed annually has dropped from about 250 to about 75.

- Project WET: Curriculum and Activity Guide. 1995. Water Education for Teachers Project, the Watercourse and the Council for Environmental Education. 518 pages. This comprehensive water education resource provides excellent learning materials and activities, including several specific to groundwater and its protection. Facilitator training and workshops in Illinois are supported by the Department of Natural Resources. This has been primarily used by teachers for enriching all levels of teaching about water and its protection. Illinois EPA has provided WET training to key staff involved in educational activities.

Section 4. Community wellhead protection education. As groundwater recharge maps are published for community water supplies, provide educational assistance in developing community well protection education programs.

The Illinois Rural Water Association's program of technical assistance to small community water supplies was greatly improved with the addition of a groundwater technician position, supported by the U.S. EPA. This position has provided great support to many communities in developing their source water protection programs.

Also, the Community Groundwater Education Collaboration of 17 persons from eight organizations was developed to support community based education programs. A packet was developed which includes available help, provides suggestions for starting a local committee, and makes suggestions related to education when road signs are placed. The collaboration advocates the startup of a community-based educational process following the development and review by local authorities of the capture zone maps for a community's wells. Illinois EPA recently compiled a summary comparison of groundwater protection ordinances from seven Illinois communities, which will be a very helpful educational and ordinance advocacy tool.

A detailed 148 page manual entitled Groundwater Protection by Local Government was developed by the Illinois Section of the American Planning Association and the University of Illinois with support by ILLINOIS EPA and DNR. This and an accompanying popular land and water circular #18, entitled Community Water: How Local Communities Can Protect their Water, are freely distributed to community leaders at meetings of the Illinois Municipal League, Township Officials of Illinois, and the Illinois Association of County Board Members.

Gardening in Your Capture Zone, a brochure offering "do's" and "don'ts" related to home activities was recently published by DNR for distribution both to homeowners with private wells and to residents of community well capture zones.

Several communities have developed education programs specifically for landowners and businesses in their wellhead protection areas. Businesses have been provided pollution prevention service interns in some areas and educational seminars in others. In some cases volunteers from schools and senior service organizations have canvassed these areas, provided information to residents, and reported findings to the municipal governing board. In other cases students stenciled water quality reminders on storm sewers. In still other areas local media featured groundwater protection maps and initiatives.

Section 5. Target private well owners for educational programs, involving licensed water well contractors, local health departments, and other organizations. These programs will address well abandonment, disinfection, testing, operation and maintenance methods;

Working through soil and water conservation districts and with support from ILLINOIS EPA, the IDOA has secured and promoted the 116 page manual HomeACRE, which provides a voluntary evaluation of home health and environment. Thousands of copies have been distributed through workshops and other events. Field events on host farms and water testing kits are often incorporated into these events.

The Illinois Association of Groundwater Professionals published the Water Well Disinfection Procedures Manual, in 1997. It documents a number of possible methods of disinfecting wells and advocates utilizing the services of a licensed water well professional in inspecting and correcting problem water wells.

Groundwater protection exhibits and water well clinics were staffed by health agency, water association, and DNR staff during 20 days of the two state fairs. Private well owners, often with children, are the primary audience and they appear to be very appreciative of the advice and materials that are distributed.

The Illinois Association of Groundwater Professionals with IDPH support conducted training for licensed water professionals including pump installers, water well contractors, and plumbers. Recently passed legislation requires six hours of IDPH approved continuing education for each group related to water well and pump procedures.

Section 6. Maintain an easily readable and useful newsletter and closely related electronic bulletin board for communication with newsletter editor, communicators, water professionals, committee persons, educators, and agency representatives with groundwater protection interests. Secure interesting articles from these clients for publication;

Due to budget limitations the Groundwater Gazette has been reduced from a monthly to a semiannual publication. It is mailed to about 800 persons from many interest groups and is available for review and downloading from the internet. Many of its articles were used in other publications such as the IML Review, the Illinois Groundwater Association newsletter, the Rural Electric News, and the newsletter of the Illinois Association of Groundwater Professionals. In this two year period several of the health and water professional associations have opened web sites. All of the agencies have web sites in various stages of development and refinement. IDNR has posted a web site for the Illinois Water Well Sealing Coalition which includes a number of timely tips on sealing abandoned wells. The internet is seen as a means of reducing distribution costs and distributing information in a timely manner, but staff will be needed to develop and maintain it.

Section 7. Secure educational funding to expand the Illinois Middle School Groundwater Education Project to new state selected regional groundwater planning areas.

Although various funding proposals were turned down, the regional groundwater committees have supported and secured support for the continuation of this program. The regional offices of education have

been instrumental along with local health, soil and water conservation district, water and wastewater utilities, farm organizations, and well contractors. As previously discussed, when funding was available, four or more counties and 250 teachers were addressed each year, but now with very limited funding, one or two counties and 75 teachers per year are provided this service.

CHAPTER IV. GROUNDWATER EVALUATION PROGRAM

Section 1. Continue to share GIS coverages in an electronic format and continue to automate the groundwater resource data base in Illinois

The ISWS furnished the Illinois EPA coverages on capture zones modeled for Shelbyville, Loves Park, and Woodstock. Furthermore, the ISWS completed additional modeling to accommodate Woodstock's newer wells (Numbers 11 and 12). The ISWS and ISGS staff are continuing to add private well data to existing databases and a process was initiated in October 1997 to cross-reference all "new" private well records between those databases. The ISWS has embarked on moving all the groundwater databases from UNIX-based machines to a new NT-based standard query language server. The goal is to provide greater access to the data by all users. The ISWS has also started a project to allow visualization of the data by linking ArcView to the databases. This includes our Public, Industrial, Commercial Survey (PICS) Database, the private well database, the water quality database and several others (aquifer properties, water levels, etc).

In addition, the ISWS also recently finished a two-year pilot project devoted to archiving some of the available ground-water data for the Metro-East area. This project will allow some project-related information to be placed on a web page for potential user viewing. The web page will be made available in the near future and is currently limited to ISWS staff.

The Illinois Natural Resources Geospatial Data Clearinghouse was established in 1998 by the Illinois Department of Natural Resources. This clearinghouse is maintained by the ISGS and serves as the gateway to GIS data and imagery for Illinois. The WWW address for this clearinghouse is <http://www.isgs.uiuc.edu/nsdihome>. This web page receives approximately 2,000 hits per month and allows users to download data and maps about Illinois' geology, water resources, and other natural resources.

During the reporting period, the ISGS ORACLE database was improved by the addition of wells logs from several studies. Under the Water Inventory Aquifer Assessment program, 3,698 well logs and 676 bridge and highway borings for Monroe and St. Clair Counties were added to the ISGS ORACLE database. Approximately 100 well logs were added for borings drilled for the monitoring well network partially funded by the Illinois Department of Agriculture.

Section 2. Continue to conduct groundwater assessments and share the information through regular updates and completed reports.

The departments and agencies responsible for these activities include ISGS, ISWS, Illinois EPA, and DNR Office of Water Resources.

ISGS/ISWS Groundwater Assessments

The Scientific Surveys have been involved with a variety of activities throughout 1997 and 1998. Foremost among these is the involvement of ground-water staff from the ISWS and ISGS as technical advisors to the Mahomet Aquifer Consortium (MAC). The MAC was formed in November 1998 to “...*further study the Mahomet Aquifer on a regional basis and to develop a plan for the management of this valuable resource.*” The MAC is composed of members from water authorities, water companies, local, county, and state agencies, and the general public, all with an interest in maintaining an adequate and good quality water supply from the Mahomet Aquifer.

The final project report, *Hydrogeology and Ground-Water Availability in Southwest McLean and Southeast Tazewell Counties, Part 2: Aquifer Modeling and Final Report* (ISWS/ISGS Cooperative Ground-Water Report 19) was completed in 1998. Funded by Bloomington, Normal, and McLean County through the Long-Range Water Plan Steering Committee, the report details the results of field and ground-water modeling investigations to estimate the availability of ground water and determine the hydrologic feasibility of developing a new 10-15 mgd well field in the Mahomet aquifer west of Bloomington-Normal. The study found that the well field is feasible but that a wide variety of regional effects could be expected depending upon the placement of well field.

A separate but related project undertaken by the ISWS was to help Springfield City Water Light and Power analyze the feasibility of developing additional water supplies to supplement Lake Springfield, especially during droughts. ISWS Contract Report 627, *Potential Ground-Water Resources for Springfield, Illinois*, addresses three ground-water alternatives - development of ground-water supplies along the banks of the Sangamon River, in the bottomlands of the Illinois River, and from the Mahomet aquifer system in Mason County.

The ISWS, working with the Office of Water Resources at DNR, addressed another ground-water related problem within the boundaries of the Mahomet aquifer in ISWS Miscellaneous Publication 187, *Ground-Water/Surface Water Interactions at Sand Lake, Mason County, Illinois*. Sand Lake is an intermittent shallow lake that appears during heavy rainfall seasons and has been cited by local residents for causing flooding problems in and around the City of Havana in western Mason County. Collection and analysis of site-specific hydrologic data shows that regional ground-water movement is the main driving force behind the existence, persistence, and recession of the lake and is not a cause for flooding but simply an indicator of high ground-water elevations in the area.

On another groundwater quantity-related issue, the ISWS and ISGS were successful in locating a new ground-water supply for the village of Homer. A summary of aquifer test results for the development of a new 100 gpm supply is presented in ISWS Contract Report 633, *Ground-Water Investigation for the Village of Homer, Ogden Township, Champaign County, Illinois*.

ISWS Contract Report 630, *Ground-Water Studies for Environmental Planning, McHenry County, Illinois*, provides planners and others in McHenry County with data and information to allow them to make informed decisions regarding activities that could have an impact on the county's ground-water resources. Specifically, this report provides 1) potentiometric surface maps of the five principal shallow aquifers in the

county, 2) capture zone estimations for high-capacity public water supply wells in McHenry county, and 3) an assessment of nitrate contamination of shallow ground water in the county. The report has been prepared in conjunction with ISGS Circular 559, *Geologic Mapping for Environmental Planning, McHenry County, Illinois*.

The ISWS and ISGS also collaborated in the study of the potential for contamination of numerous natural areas within the state. ISWS Contract Report 612, *Vulnerability of Illinois Nature Preserves to Potential Ground-Water Contamination, Volume I: Methodology and Initial Assessment*, provides a tiered approach to assess nature preserve sensitivity and vulnerability to potential ground-water contamination. A statewide screening of 207 nature preserves using GIS techniques was used first to predict preserve sensitivity based on soil leaching characteristics and depth to uppermost aquifer. Site surveys then were conducted at 85 preserves expected to be most sensitive to ground-water contamination. Hydrologic, geologic, and land-use information was collected for each site. Roughly 30 percent of the sites were classified as having moderate to high vulnerability. These data are forming the basis for reclassification of contributing ground-waters as Class III, Special Resource Ground Water by the Illinois Pollution Control Board.

Ground-water quality has been the subject of a host of other Scientific Survey studies, particularly focusing on agricultural chemicals in ground water. Foremost among these is the development of a statewide, dedicated monitoring well network to evaluate pesticide contamination of ground water in Illinois. Funded through the IDoA, the ISWS and ISGS are installing the wells and then collecting samples for IDoA analysis. Further discussion of the network is provided in the next Section.

In July 1998, the American Water Works Association published *Agricultural chemicals: effects on wells during floods* written by several ISWS scientists. Water pumped from four municipal water supply wells located within the Illinois River floodplain was analyzed for nitrate and atrazine. Although concentrations of atrazine in the Illinois River were as high as 12 µg/L, the concentration of atrazine in groundwater pumped remained below the 0.1 µg/L detection limit in three of the four wells. A small breakthrough of atrazine was observed in one well, a collector well with radial laterals extending beneath the river bed.

The transport of surface applied pesticides to underlying ground water was the subject of a very detailed investigation in another ISWS project, *The Effect of Periodic Flooding on the Movement of Pesticides in the Subsurface*. A test plot located at the Rice Lake Conservation Area along the Illinois River was chosen to study chemical tracer movement prior to, during, and after flooding. The area is deliberately flooded every fall to attract waterfowl. Atrazine, bromide, and nitrate enriched in ¹⁵N were sprayed at the surface in the center of the test plot prior to flooding. Tracers moved rapidly after flooding, almost exclusively in a vertical direction. Considerable amounts of natural nitrogen were released from the soil after flooding, especially in the uppermost two feet. It appears that most of the atrazine remained bound in the top layer of the soil, but dissolved atrazine moved rapidly and apparently migrated in the groundwater off site.

In addition, the ISGS has investigated the groundwater quality near animal waste storage facilities, in southwestern Illinois' Sinkhole Plain, and in alluvial aquifers in central Illinois. Krapac and others have monitored and evaluated the effects of hog waste lagoons and storage pits at several sites around Illinois,

providing critical data on an issue that generates a tremendous amount of public interest. Some results are listed in Appendix 1 and others will be released in the future. Panno and others have studied groundwater in the karst areas of Illinois, focusing on the southwestern Illinois' Sinkhole Plain. These researchers have published their results in a variety of formats from educational posters to technical papers (see Appendix 1). Risatti and Mehnert are studying the water quality in alluvial aquifers, those aquifers that are hydraulically connected to bodies of surface water such as rivers and streams. Some results from their work at Mt. Pulaski and Henry are published, while more will be published in the future.

Section 3. Continue to utilize innovative and cost effective methods to implement statewide groundwater quality monitoring

The State of Illinois conducts many different water quality monitoring programs to detect impairments to groundwater. Groundwater in Illinois is routinely monitored for biological and chemical contaminants. Groundwater quality monitoring programs consist of fixed station networks and intensive or facility related surveys of specific pumping centers.²

Ambient Network of Community Water Supply Wells - The Illinois EPA continues to operate an Ambient Network of Community Water Supply Wells (CWS Network) consisting of 362 fixed locations.³ The CWS Network is designed to:

- Provide an overview of the groundwater conditions in the CWS Wells in Illinois;
- Provide an overview of the groundwater conditions in the major aquifers in Illinois;
- Establish baselines of water quality within the major aquifers in Illinois;
- Identify trends in groundwater quality in the major aquifers in Illinois; and
- Evaluate the long term effectiveness of Clean and Safe Drinking Water Act program activities in protecting groundwater in Illinois.

² A detailed discussion of water quality monitoring programs, field, laboratory and data management procedures are documented in the Illinois EPA Bureau of Water, "Quality Assurance Program Plan" (Illinois EPA 1994).

³ For a more detailed description of the CWS Network monitoring procedures, locations, stratification criteria, and principal aquifer locations refer to the Illinois State Water Quality Report (1999, Clean Water Act, Section 305(b) Report).

Pesticide Monitoring Subnetwork of the CWS Network - Since 1993, the Illinois EPA has operated a Pesticide Monitoring Subnetwork of the CWS Network. Initially, Illinois EPA tested all wells in the CWS Network for triazine and alachlor using immunoassay screening methods. However, in the 1998 monitoring cycle Illinois EPA discontinued the use of immunoassay and randomly selected 50 percent of the network wells which were then analyzed for synthetic organic chemicals (SOCs) using standard laboratory test methods. In the year 2000 monitoring cycle, the remainder of the wells in the network will be analyzed for SOCs. The Illinois EPA anticipates that this rotation will be maintained in the future.

Rotating Monitoring Network - The purpose of this monitoring network is to maximize resources and increase groundwater quality monitoring coverage at CWS wells. During the 1997 monitoring cycle, the Illinois EPA initiated a rotating monitoring network program. As a result of funding limitations, the Illinois EPA was forced to evaluate the CWS Network monitoring frequency. Illinois EPA determined that the primary purposes, referred to above, of the CWS Network could be realized by reducing the monitoring frequency of the network to a biennial basis.

The Illinois EPA is currently able to concentrate on specialized monitoring at high priority areas during alternate years. In 1997, monitoring was focused on concerns related to highly susceptible CWS wells. These wells were prioritized as a result of the detections of organic contaminants in treated water samples obtained during routine monitoring required by the Safe Drinking Water Act. During the 1999 monitoring cycle, attention will focus on “new” CWS wells with little monitoring history.

Dedicated Pesticide Monitoring Well Network - The Illinois Department of Agriculture is developing a dedicated monitoring well network designed to monitor shallow groundwater for certain agricultural chemicals. The purpose of this network is to provide data for testing the utility of the map entitled, “Aquifer Sensitivity to Contamination by Pesticide Leaching in Illinois.” This aquifer map could be utilized as a predictive tool to determine the occurrence of pesticide detections in groundwater (as described in the Illinois Generic State Management Plan for Pesticides in Groundwater). To date, 136 “dedicated” monitoring network wells have been installed as a part of this effort. The Department of Agriculture has initiated a monitoring program to sample six of these wells per month, with all analyses being conducted at the Illinois Department of Agriculture’s laboratory.

Monitor the long-term effects of the 1993 Flood on Groundwater Quality - From May of 1994 to September 1995, the Illinois Department of Public Health conducted a study to evaluate private water wells and sewage systems which were affected by the Flood of 1993. This study was conducted through a grant provided by the federal Centers for Disease Control (“CDC”) and Prevention. A total of 743 private wells were identified as flooded and were inspected during this study. Of this number, 299 wells were found to be abandoned and were not evaluated, and 53 well owners refused to participate in the survey or to have their wells sampled. The remaining 391 wells were evaluated and sampled for coliform bacteria and nitrate. Of this number, 141 (36.1 percent) tested positive for coliform bacteria and 45 (11.5 percent) tested positive for *Escherichia coli* (*E. coli*). (See Chapter X, Section 5, for a more detailed description of this study.)

Lower Illinois River Basin National Water-Quality Study - As part of the National Water-Quality Assessment ("NAWQA") Program the U.S. Geological Survey ("USGS") is assessing both the Lower and Upper Illinois River Basin ("LIRB" and "UIRB", respectively). The NAWQA studies are designed to be active for six to seven years, with subsequent minimal data collection for several years, followed by "full scale." This cycle is used for determining water quality trends. Copies of the "environmental setting" report of both the LIRB and UIRB are currently available.

Data collection is basically completed in the LIRB and presently the study is in the analysis and report writing phase. The USGS and Illinois EPA collected untreated groundwater samples from CWS wells from 1984 to 1991. The USGS will utilize this data to conduct statistical analysis of the groundwater chemistry in the LIRB for the purpose of determining the status of, and trends in, groundwater quality of this area.

The USGS has begun to instrument and collect data in the UIRB. A pilot study of the UIRB was conducted in the 1980's, but it dealt exclusively with surface-water quality. However, the present study of the UIRB includes both surface- and ground-water quality.

Section 4. Continue to implement and improve overall groundwater quality indicators

Trends in Groundwater Quality - The statewide detection rate for VOCs in the CWS Network wells compares favorably with the one-time, statewide monitoring program for all CWS wells (conducted from 1985 thru 1988). The state-wide detection rate for VOCs in CWS wells does not appear to have increased since 1988. Further, monitoring data on SOC's versus Immunoassay testing conducted in the CWS Network indicates that certain degradation products may be present in Illinois groundwater. This may account for low level immunoassay detections for triazine and alachlor compounds with no confirmation by traditional synthetic organic extraction methods. Future monitoring initiatives may need to be established to address this issue. Figures 4 through 7 illustrate trends in the principal aquifers in Illinois as indicated by results obtained through monitoring conducted at the CWS Network wells. The bar graphs indicate the number of wells with no trend, upward trends or downward trends.

As illustrated, groundwater quality in three of the four major aquifer groups in Illinois are experiencing steady-state, or slightly decreasing, levels of contaminant detections. The exception to this analysis is the shallow bedrock aquifers, which show a slight upward trend in the number of wells that have an increase of the levels of contamination.

Figure 4

Groundwater Quality Trends for Major Sand and Gravel Aquifers 1996 - 1998

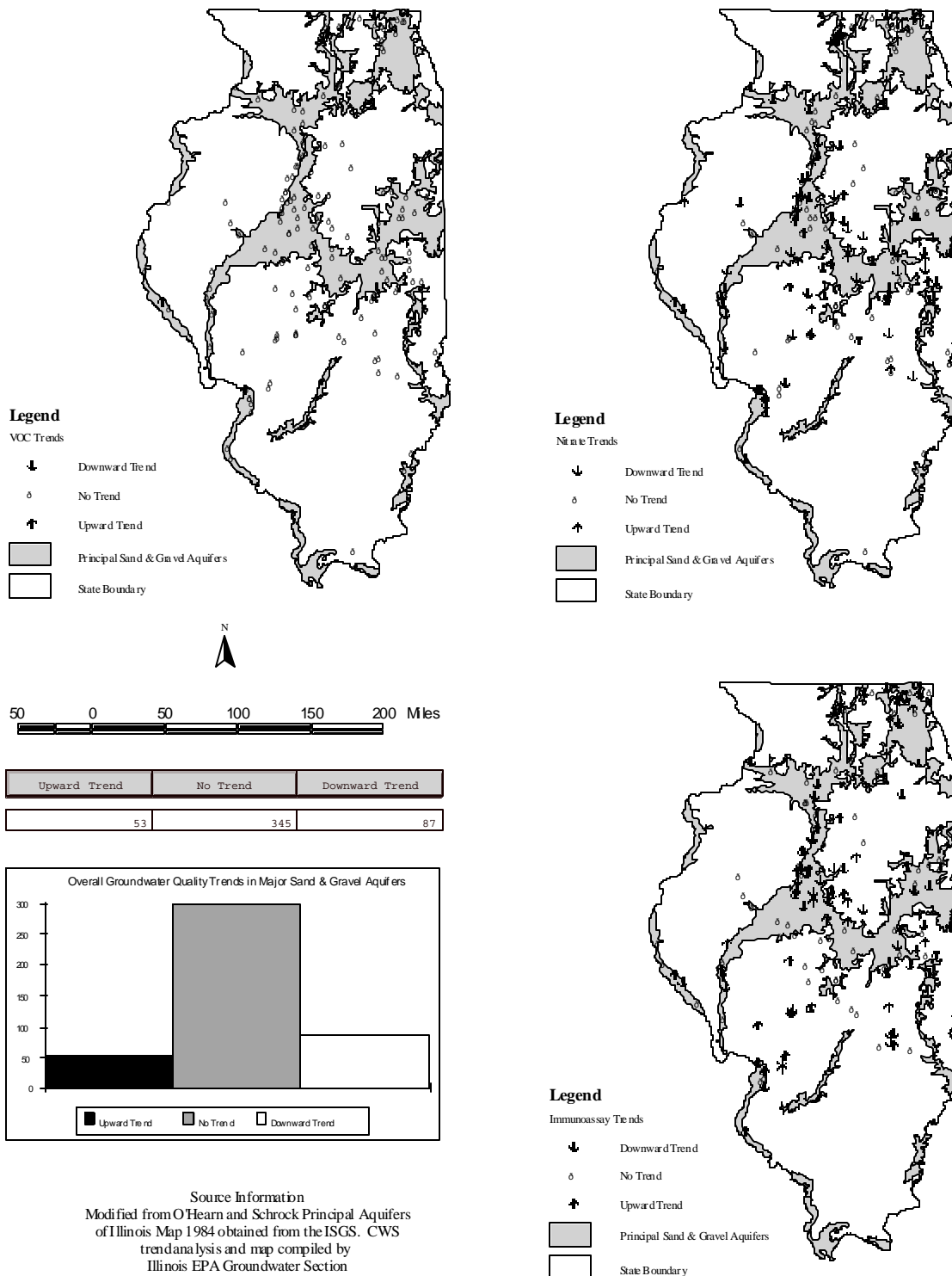


Figure 5

Groundwater Quality Trends for Major Shallow Bedrock Aquifers 1996 - 1998

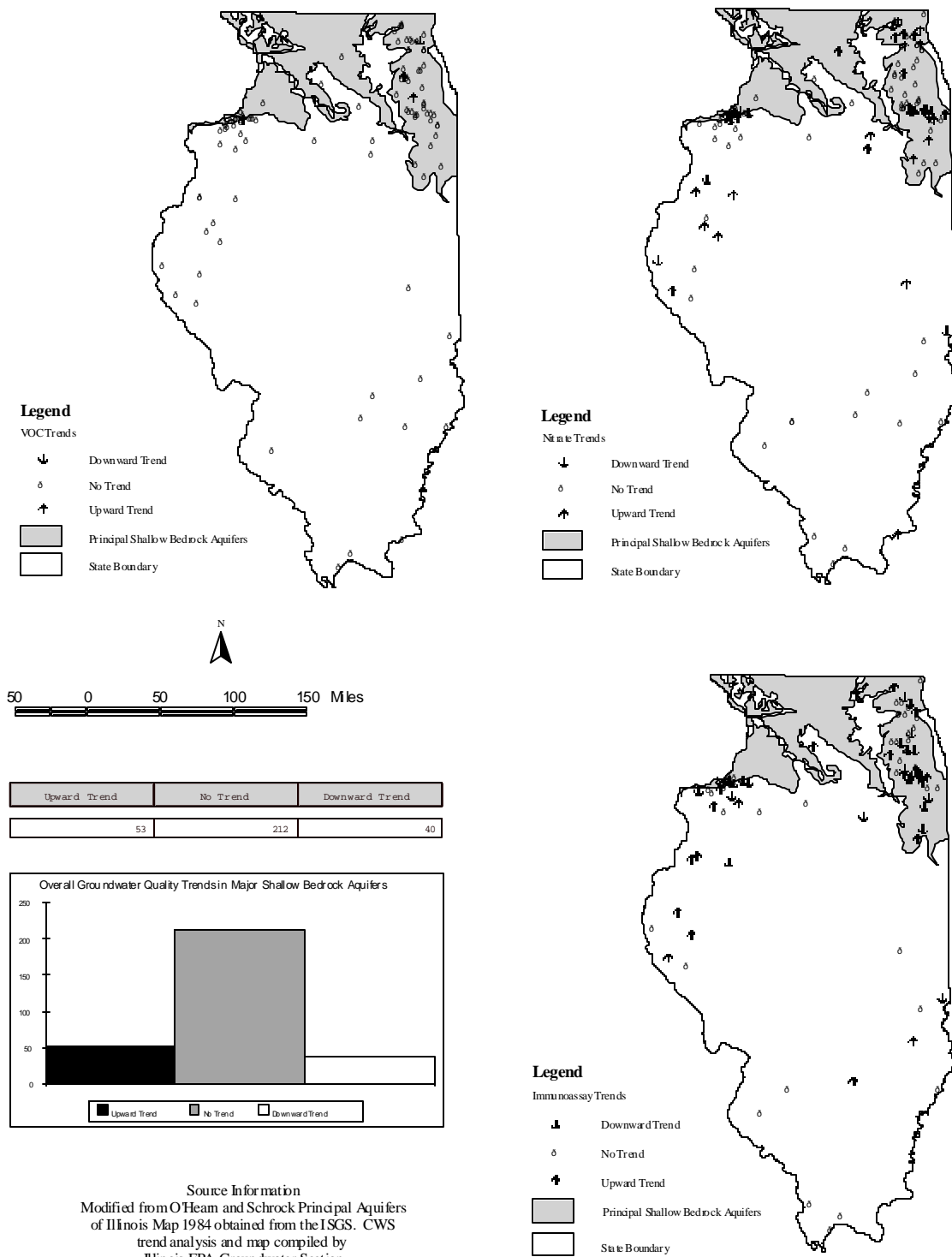


Figure 6

Groundwater Quality Trends for Major Deep Bedrock Aquifers 1996 - 1998

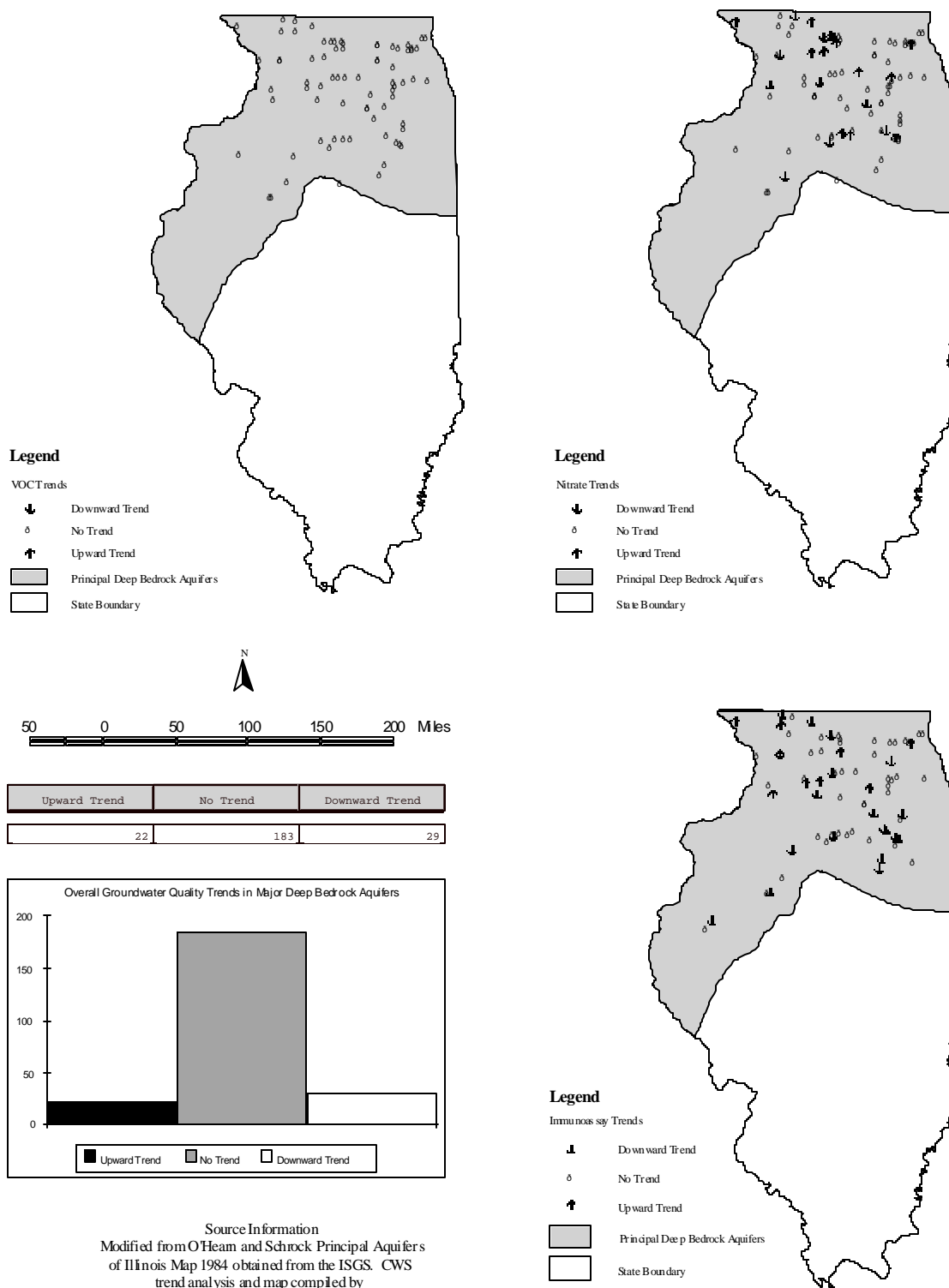
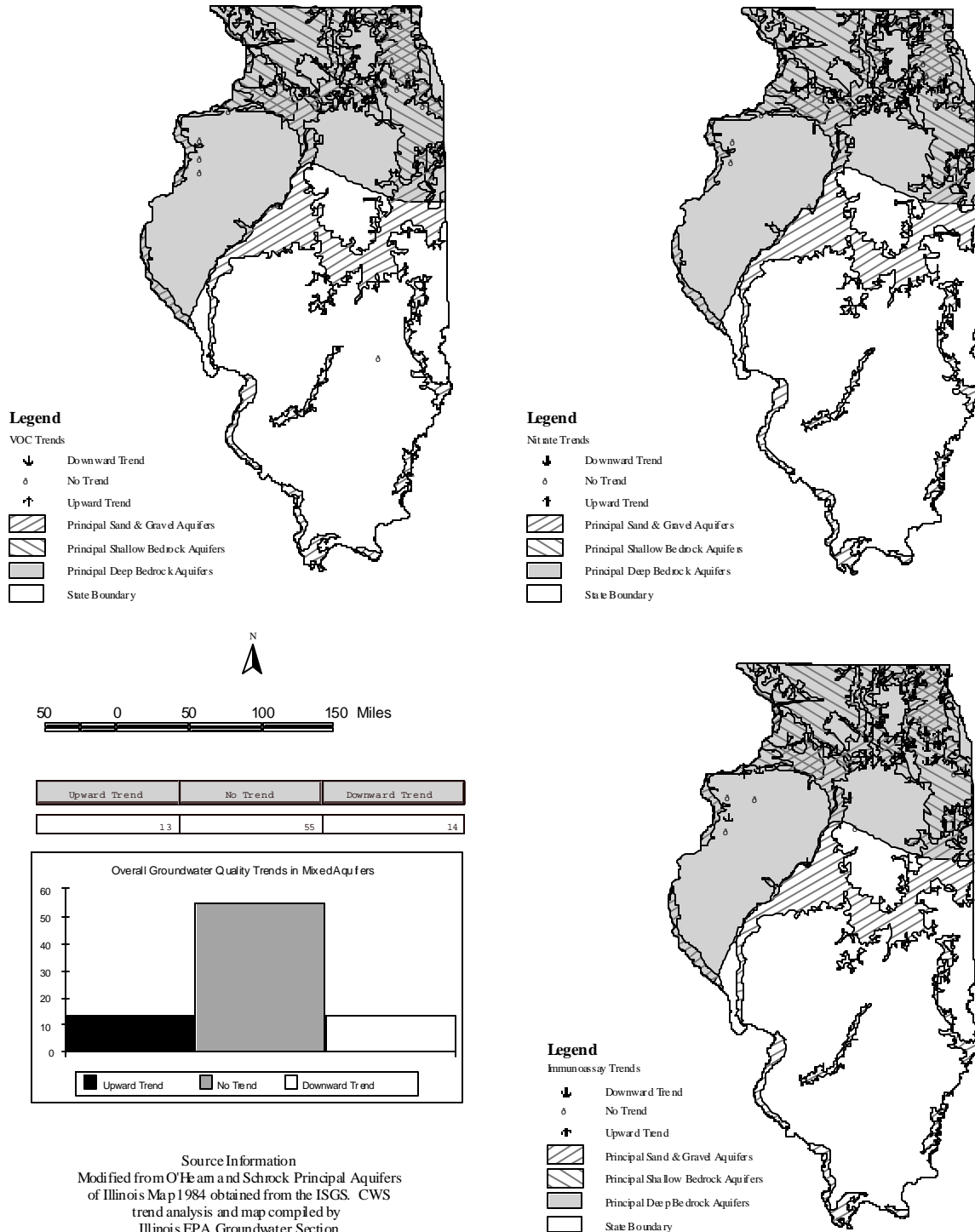


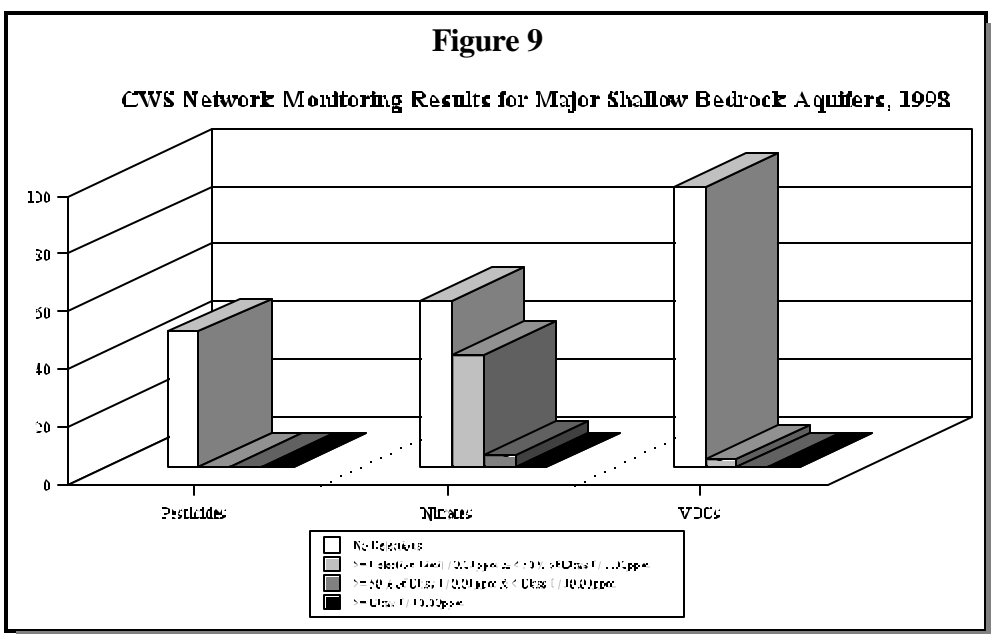
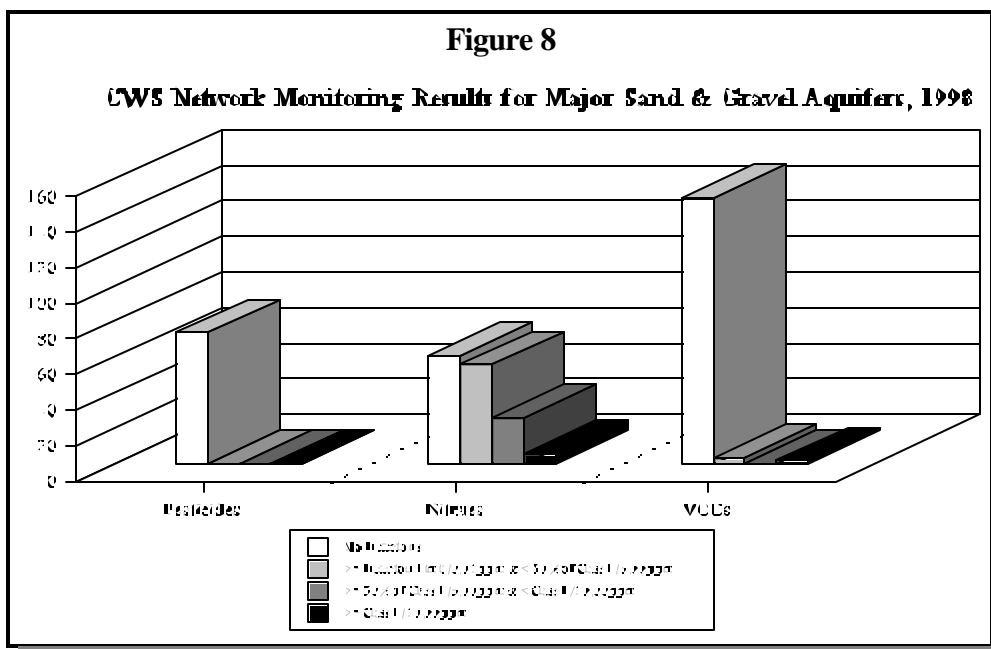
Figure 7

Groundwater Quality Trends for Mixed Aquifers 1996 - 1998



Water Quality Summary by Principal Aquifer

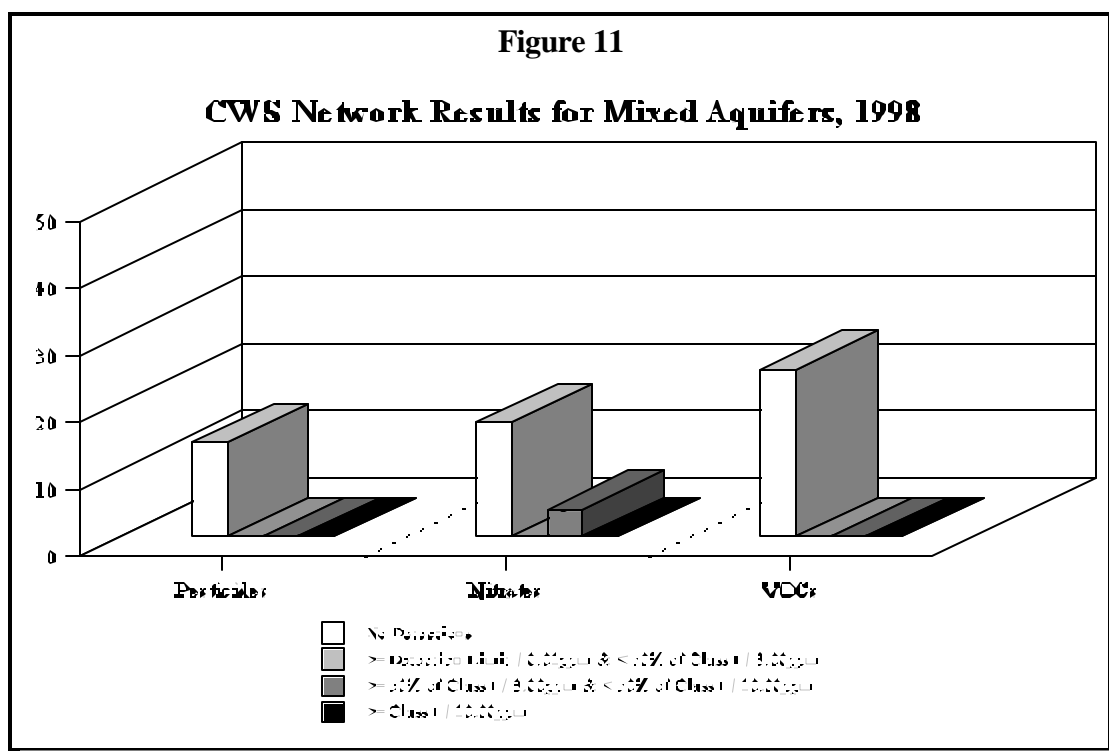
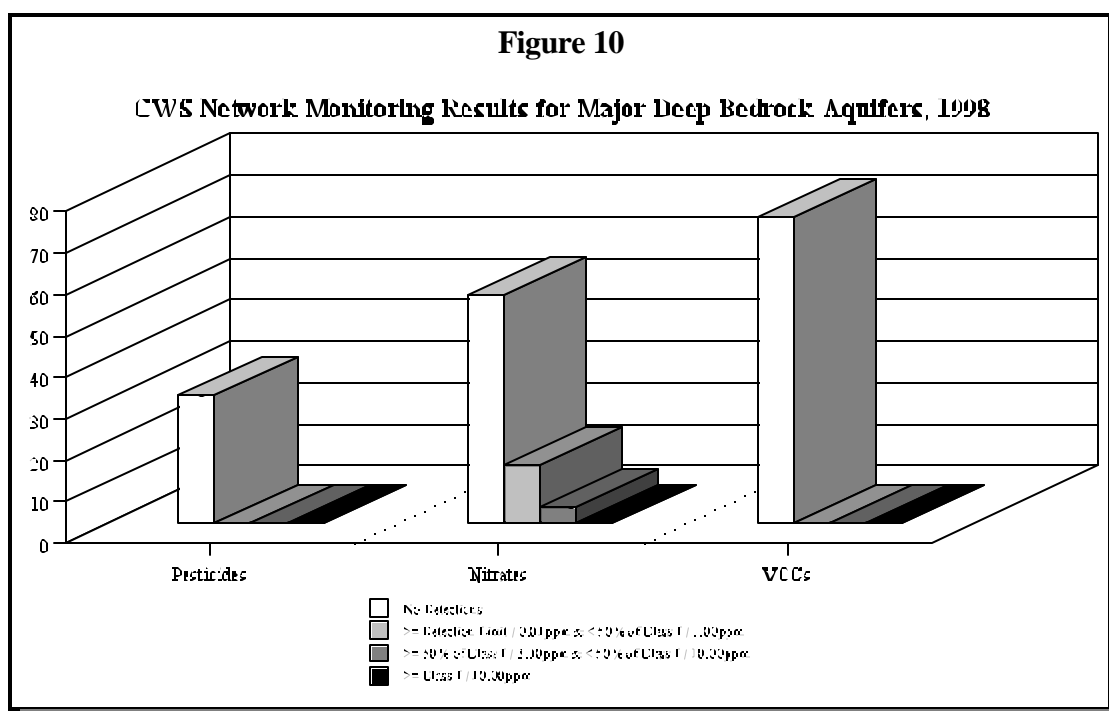
Figures 8 through 11 summarize the water quality data obtained from the CWS Network wells in the four principal aquifers in Illinois⁴. Figures 8 through 11 summarize the incidence of the detection of pesticides, nitrates or VOCs in the CWS Network wells in the four principal aquifers for one sampling event in 1998⁵. The bar graphs illustrate the numbers of wells with no detections, the numbers of wells with sample results greater than or equal to the detection limit (0.01ppm) and less than 50% of the class I standard (3.00 ppm), the numbers of wells with sample results



greater than 50% of the class I standard and less than the class I standard (10.00 ppm); and the numbers of wells with sample results greater than the class I standard.

⁴ For a more graphical information on the results of the CWS Monitoring Network please refer to the Illinois State Water Quality Report (1999, Clean Water Act, Section 305(b) Report).

⁵ For a more graphical information on the results of the CWS Monitoring Network please refer to the Illinois State Water Quality Report (1999, Clean Water Act, Section 305(b) Report).



CHAPTER V. GROUNDWATER QUALITY STANDARDS AND TECHNOLOGY CONTROL REGULATIONS

Section 1. Evaluate the need to develop Class III: Special Resource Groundwater Standards

Class III Special Resource Groundwater is groundwater which may take on an ecologically vital role, such as supporting a wetland or cave. One area in Illinois has been designated as Class III groundwater since this definition for Class III groundwater has been made, and another 84 areas are under consideration. Since these waters are ecologically vital to the area they are found in, more stringent standards may be developed to classify and subsequently protect areas which are deemed Class III.

Section 2. Evaluate dedicated Nature Preserves for Class III designation

As of late 1998, 279 nature preserves have been identified in Illinois. These are being reviewed to see if they meet the criteria set forth to be considered Class III groundwater. Several studies have been conducted on these preserves to determine groundwater sensitivity/vulnerability. Using a groundwater sensitivity map of Illinois it was determined that approximately 100 of these preserves have high or very high sensitivity to groundwater contamination. Another study using field assessments on a subset of 85 preserves found that 26 preserves have high or very high vulnerability for groundwater contamination. From these studies, it can be determined that 30 to 40% of nature preserves would be good candidates for Class III designation at this time.

Section 3. Continue to implement and integrate the groundwater quality standards into environmental programs

The Illinois EPA BOW is coordinating with the Illinois EPA BOL to establish a consistent groundwater standard and cleanup objective for Methyl Tertiary Butyl Ether ("MtBE"). The Illinois EPA OCS will develop a health based number for MtBE that will be used as a Class I groundwater standard and as a Tier 1 cleanup objective. An aesthetic value (taste and odor threshold) would be used for the preventive response level in the groundwater standards and as a cleanup objective that must be met at any existing point of use.

Section 4. Continue to update and amend the groundwater standards to parallel the drinking water standards adopted by U.S. EPA

The Illinois EPA is proposing a groundwater quality standard for MtBE, a common gasoline octane enhancer. Though the U.S. EPA has not yet adopted a MCL for MtBE, its occurrence in approximately 25 Illinois groundwater based community water supplies since 1994 raises concerns. The standard will be based on a draft health advisory and other state approaches which are protective of human health and the environment. The preventive response level will be based on the taste and odor threshold, which is significantly lower than health affect levels. Coordination with the U.S. EPA is underway in an effort to determine appropriate and economically reasonable treatment alternatives for MtBE in groundwater.

There is also ongoing coordination within the Illinois EPA to concurrently amend regulations which establish cleanup objectives, so that those regulations will mesh with the groundwater quality standard that is established for MtBE.

Section 5. Continue to implement preventive notice and response programs and integrate with environmental programs

As part of a “new well program” the Illinois EPA will conduct groundwater monitoring and potential source identification as each new community well becomes active. The monitoring will serve to establish a baseline of water quality data for the well, but will also provide data that may initiate the preventive notice and preventive response activities of 35 IAC 620.305. The concurrent potential source identification will fulfill the requirement that a well site survey be completed within five years of initiation of the preventive notice and preventive response activities. There is currently a backlog of “new” community wells which have not undergone previous raw water monitoring. This population of community wells, coupled with the newly permitted community wells that are coming on line, will provide a basis for water quality assessment in alternate years when the community water supply, ambient network is not being sampled.

Section 6. Continue to implement the technology control regulations and improve a database for tracking and evaluating compliance data

The Office of the State Fire Marshal (“OSFM”) now sends the Illinois EPA a copy of all underground fuel storage tank permits on which a potable well is indicated to be within 400 feet. In the event that new construction is indicated on the permit, the Illinois EPA issues a letter requiring a setback zone determination be made. If the new tanks are to be located outside the minimum setback zone of the well, the locations of the well(s) and tank(s) are recorded in the compliance database and a letter is issued stating that no setback zone waiver or exception is required. If the proposed tank locations are within a minimum setback zone, a letter is issued requiring the submission of a waiver request or petition for an exception to the Board. If a waiver or exception are required a record will also be made in the compliance database.

As an extension of the process in which county health departments are notified of waivers that have received Illinois EPA concurrence, a similar notification is being sent for setback zone determinations that do not require a waiver. Waiver concurrences are only issued if a **new** potential source or route is to be located within a minimum setback zone. If review of site data indicates that a potential source or route is not “new” as defined in the Act, no waiver is required. Previously, the location of the potential source(s) or route(s) and the associated well(s) were not recorded if no waiver was required. However, this meant that the locations of many active private wells, and the locations of many existing potential sources and routes were not being recorded. Many times the information provided to make the setback zone determinations is the first and only indication the Illinois EPA has that a private well, or potential source or route exist. The locations of the potable wells and the existing potential sources and routes are now entered into the compliance database system so a permanent record is created.

Section 7. Evaluation of activities located proximate to CWS where local groundwater protection management efforts are completed or in progress will be given priority

Two hundred fifty two wells, representing 83 community water systems that have adopted maximum setback zones, have been given priority for review to find sites that may be subject to the technology control regulations (35 IAC 615/616). Preliminary assessment indicates that there are approximately 16 sites that may be subject to the technology regulations. These sites are only the ones that store fertilizer, pesticides, deicing agents or road oil. These types of sites were selected for this round of assessment because they were relatively easy to identify during the well site survey process as sites subject to regulation. Many sites that may generate waste will require significant additional interaction with the facility to determine, if a regulated waste is generated, and if storage and disposal practices of that waste meet the criteria for regulation by the technology control regulations. The types of sites selected for this round of evaluations will require minimal follow-up contact to determine if the regulated units are inside the setback zone.

Proceeding with compliance activities at these prospective facilities has been delayed since there has been no electronic storage system for the groundwater monitoring data that will be produced. However, a prototype water quality database has been created to store monitoring results from community wells. This database will be evaluated to determine its utility for storing compliance groundwater monitoring data from sites regulated under 35 IAC 615/616. If the prototype can be used for this purpose, contacts with facilities to initiate compliance activities can be increased.

Section 8. Evaluation and compliance determination for activities referred by permit programs will also be given priority

The Illinois EPA BOW Groundwater Section and Compliance Assurance Section (“CAS”) have discussed the potential of using the Permit Compliance System (“PCS”) to evaluate BOW permitted facilities that have groundwater monitoring systems. A set of test data were also processed to allow the Groundwater Section the opportunity to evaluate how the system reports out the results. The PCS is typically used to assess compliance of surface water discharges using Discharge Monitoring Reports (“DMR”). However, this main frame program allows the user to establish different criteria for each site. Therefore, if a permitted facility is monitoring groundwater, comparison values that are equal to a fraction (50 - 75%) of the groundwater standard can be entered into the PCS for each constituent being monitored. If the specified levels are exceeded, it will be an indication that it is time for preventive actions to be taken by the facility to preempt a violation of the groundwater standards. The primary advantage to using this system is that there is an existing staff familiar with the PCS who could see that the data is entered and the routine reports are run. While the responsibility of evaluating the data for compliance with the groundwater standards and determining what, if any, response actions are appropriate still falls on the Groundwater Section, the application of the PCS provides the data in a neat consistent format. The groundwater data can be reviewed on a regular basis instead of just before permit renewal. Upward trends in monitored concentrations could be noted, and preventive actions taken before the groundwater standards are exceeded.

Section 9. Continue cooperation between the Illinois EPA and the IDPH to provide statewide education seminars on the implementation of the technology control and groundwater standards regulations

The Illinois EPA and the IDPH are the primary state agencies responsible for implementing this groundwater protection goal. Coordination between Illinois EPA and IDPH has been good and there has been success with implementing this activity.

Through the SDWA, the IDPH inspects non-community public water systems. Monitoring for pesticides, IOCs, PCBs and VOCs took effect in 1993 for 535 non-transient non-community water systems. Monitoring for lead and copper occurred in 1994. By the end of 1996, approximately 75 percent of these water systems were sampled for the above parameters. In 1999, an additional 3% of non-transient wells were identified and not sampled as of yet. This brings the total sampling percentages to 94% for lead and copper, 95% for SOCs, 94% for IOCs, and 95% for VOCs.

The Illinois Water Well Construction Code and the Illinois Water Well Pump Installation Code were amended in 1997. For quite some time IDPH and the Illinois Association of Groundwater Professionals had been working on amendments to the Illinois Water Well and Pump Installation Contractors Licensing Act to include continuing education requirements for licensed water well and pump installation contractors. In addition to water well construction technologies, groundwater protection is a major topic in continuing education programs. These amendments to the Illinois Water Well Construction Code and the Illinois Water Well Pump Installation Code were made effective April 1, 1998.

The Well Site Survey Reports and other regulatory initiatives under the IGPA provide a valuable avenue for implementation and prioritization of the technology control and groundwater regulations for community wells. Through the permitting and inspection of new private, semi-private, non-community, and non-potable water wells and through its educational program, IDPH has provided technology control and groundwater regulations. The IDPH and the Illinois Association of Groundwater Professionals cosponsored 10 water well construction and groundwater protection seminars throughout the state during 1995-96 for local health department and IDPH water program staff and licensed water well contractors.

The Illinois EPA contacts the IDPH whenever the contamination or siting of a private or non-community well is a concern with regard to these regulations. Through six regional offices and 83 local health departments, IDPH will continue to utilize efficient methods to implement statewide groundwater quality monitoring.

The Illinois EPA has coordinated with the IDPH to provide information at three seminars held across the State. The seminars were part of the summer re-certification programs being sponsored by the Illinois Pest Control Association ("IPCA"). The IDPH regional staff provided information on well construction, case histories of misapplication and information on detections of Chlorpyrifos-oxon, which is an intermediate break down product of Chlorpyrifos (Dursban). Chlorpyrifos-oxon is as toxic or more toxic than Chlorpyrifos, but is typically a short lived break down product. However, in the presence of chlorine it

lasts significantly longer before completely breaking down into nontoxic by-products. The Illinois EPA provided information on well setback zones, setback waivers and exceptions, technology control regulations and Minimal Hazard Certification. This type of information is important to residential pest control operators because many of these small businesses are operated from their homes. In areas where private wells are used as a source of water, the potential for the establishment of a pesticide storage area within a setback zone is high. However, due to the low volume of pesticides stored at many of these small businesses, they are excellent candidates for Minimal Hazard Certification. This certification relieves many of these small businesses from the requirements of the technology control regulations. This was the first time that the IPCA had invited regulators to give presentations. Many seminar participants had little previous knowledge of these topics and feed back was mostly positive.

CHAPTER VI. WELLHEAD PROTECTION PROGRAM

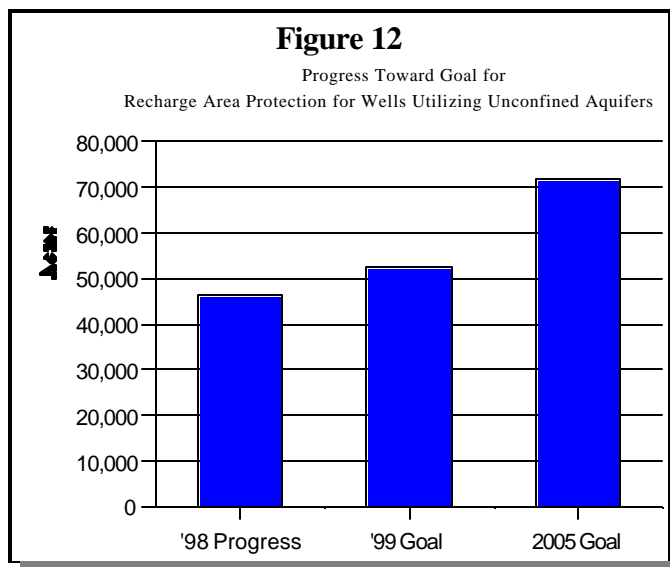
Section 1. Publish wellhead protection and assessment data on the Illinois EPA Homepage

The Illinois EPA will work to further enhance and integrate H₂O Works, Water Body System, and Arc/Info GIS to facilitate ground/source water assessment, delineation, and public access over the Internet to the Illinois EPA Home Page. This work will assist in further development of the Illinois EPA Home Page which currently contains fact sheets on Illinois lakes and streams. Lakes and streams within each of the United States Geological Survey's ("USGS") eight-digit watersheds are described and assessed across the state. These fact sheets include surface water source information and water assessment data that is easily understood and available to the public over the Internet. The Illinois EPA has begun to work with the USGS in expanding this Internet site to include the existing and new information on source water delineation and assessment for all community water supplies across the state.

This effort will further assist with meeting the consumer confidence report and public information requirements under the 1996 SDWA amendments.

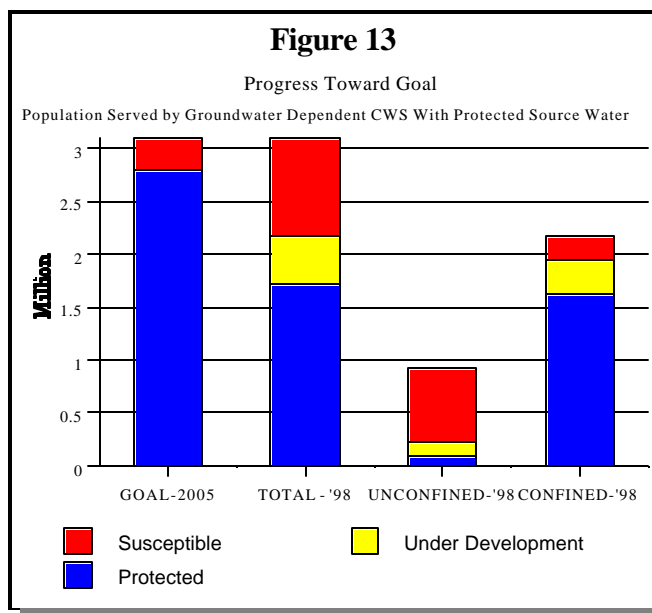
Section 2. Increase the percentage of recharge acres with full protection progress established or under development

The Illinois EPA has established a goal of increasing the percentage of groundwater recharge areas (acres) with protection programs established or under development to a level of 45% by the year 2005. Furthermore, a goal of protecting 90% of the state's population utilizing community water supply



groundwater sources by the year 2005 has been established.

The Illinois EPA has made considerable progress in meeting these groundwater protection goals through such initiatives as the groundwater standards, Regional Groundwater Protection Planning Programs, and the SDWA Monitoring Waiver Program. Illinois continues to address the need for protecting groundwater by accomplishing the mission set forth in the Illinois Groundwater Protection Act and through federal, state and local partnerships to establish groundwater protection programs. These partnerships have utilized regulatory and non-regulatory programs to achieve success. Illinois EPA is measuring the population served by systems with protected unconfined and confined aquifer resources.



Since approximately one million people in Illinois rely on susceptible unconfined aquifers for their source of drinking water, Illinois has placed added emphasis on the protection of these groundwater systems. The majority of community water supply systems in Illinois are considered small systems. Thus, when compared to the overall population of the state may appear insignificant. However, when these small systems are adversely impacted by contamination, they often lack the available resources to address these concerns. Unlike larger water supplies, small supplies may not have experts on staff to solve water quality problems or the rate base from which to draw funds for corrective measures. Therefore, protecting the resources utilized by these small water supply systems are critical.

Protecting the land surface areas around susceptible unconfined aquifer wells (recharge areas) can help prevent contamination of groundwater. Coupled with the population served, measuring the acres with protection programs under development or in place provides an effective measure of Illinois' progress in protecting these susceptible areas.

Section 3. Continue to implement and integrate the WHPP elements into protecting the regional groundwater sources for public water supply wells

The Illinois EPA is the primary agency responsible for implementing this program and continues to make progress in completing this effort. However, there remains a great deal of work to be done in this area. Integration of WHPPs have been, and will continue to be, implemented for CWS wells in Priority Groundwater Protection Planning Regions.

There are certain programmatic indicators that show CWS groundwater protection progress within the

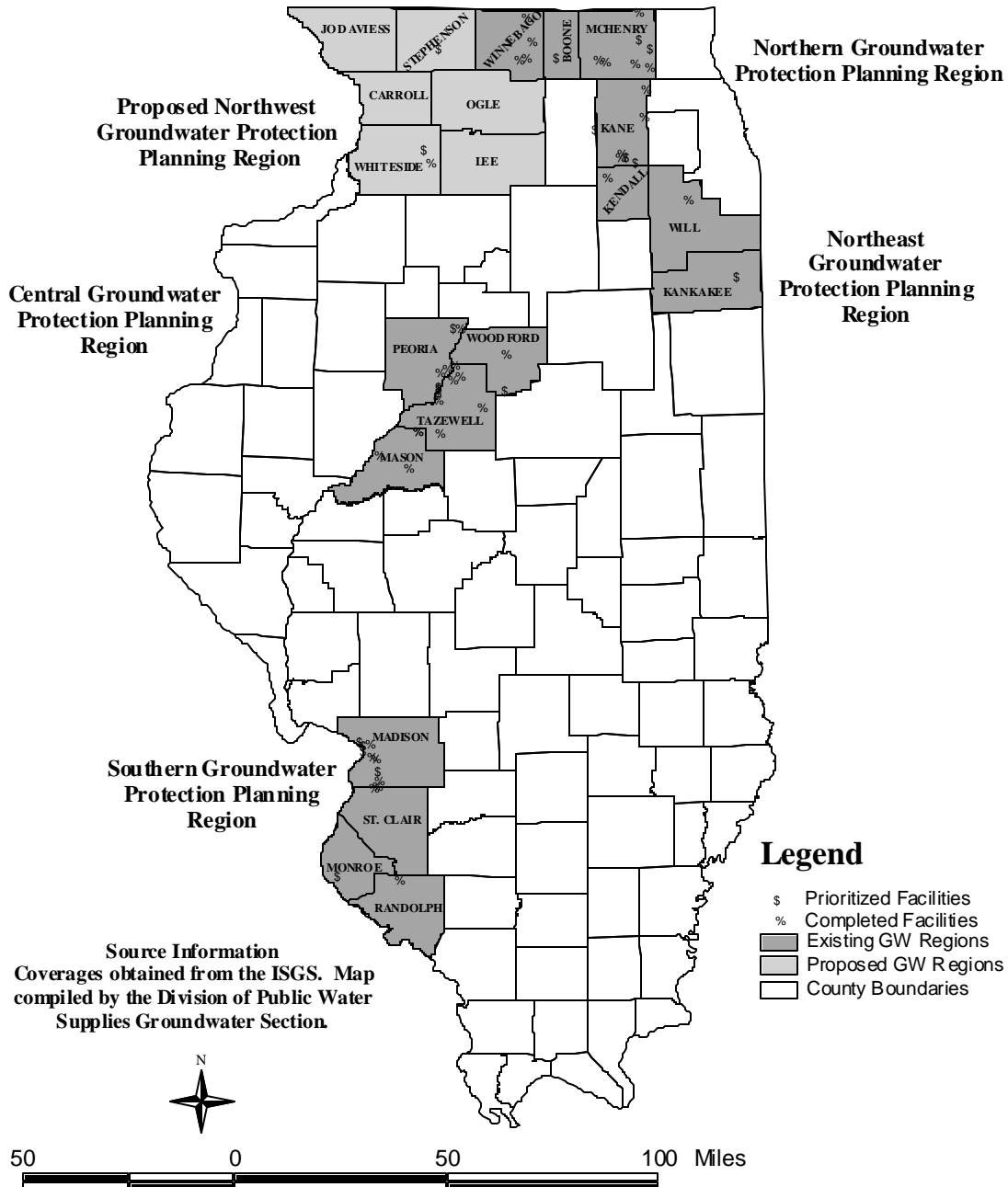
Priority Groundwater Protection Planning Regions. In general, the first step of developing a CWS groundwater protection program involves determining the recharge area for CWS wells in unconfined aquifers utilizing existing aquifer property data. In Illinois, the recharge area is based on a five-year time of travel delineation. The second step involves determining the potential sources, potential routes, and the land use zoning within these recharge areas. The third step involves establishing a local team of stakeholders to develop a groundwater protection strategy, and most importantly, taking the necessary measures to implement these activities to protect groundwater resources. The last step is the development of a local emergency planning document that addresses: natural disasters, chemical contamination, and physical disruptions that threaten the supply and distribution network of the public water supply.⁶

During the past two years, the Illinois EPA has continued to work on recharge area delineations for 24 prioritized CWSs within the Groundwater Protection Planning Regions. Of the 24 prioritized systems 19 CWSs remain to be finished. These should be completed by February 2001. Figure 14 illustrates the recharge area delineation status (WHPP, step1) for the CWS within the Priority Groundwater Protection Planning Regions. Further, a summary of WHPP progress for each CWS located within Priority Groundwater Protection Planning Regions is described in Appendix 2.

⁶These programmatic indicators are described in detail subsequently in the following Sections of this report.

Figure 14

Groundwater Protection Planning Regions Recharge Area Delineation Status



Section 4. Develop and implement source protection criteria to use in the planning, construction and location of new community water supplies

The Illinois EPA has developed procedures for CWS systems expanding through the construction of new wells. In addition to the setback requirements and other regulations under the Act, an outreach effort will be initiated to obtain the necessary hydrogeologic information to delineate source water protection areas for new wells utilizing unconfined aquifer settings as required under Section 1453 of the 1996 SDWA. In Illinois, much of the hydrogeologic information needed to complete a delineation is already required to be collected while the groundwater resource assessment is being conducted to determine the availability of groundwater at a proposed well site. An informational pamphlet has been drafted and is being utilized by the Division of Public Water Supplies through the CWS well permitting process. This process has resulted in the additional collection of aquifer property data. The Illinois EPA will utilize this data to complete delineations to serve as the technical support to CWSs wishing to initiate:

- maximum setback zones;
- eligibility for chemical monitoring reform/permanent monitoring relief;
- lab fee cost savings;
- prevention programs including the pollution prevention and conservation reserve programs.

Section 5. Continue to prioritize wellhead protection efforts within the Groundwater Protection Planning Regions

The Illinois EPA is the primary Agency responsible for implementing this groundwater protection goal. The Illinois EPA continues to work very closely with the regional planning committees to establish groundwater protection programs at the local level; however, these programs are very time consuming and significant work is needed in this area.

The Groundwater Section continues to coordinate with the regional groundwater protection planning committees to implement programs and assist with targeting local contacts and interest groups. Each regional committee has adopted specific mission goals and objective statements to advocate groundwater protection practices and procedures to municipal, county, state and other local units of government throughout their respective regions. These goals and objectives are useful in the prioritization and development of local groundwater protection programs, many of which are described in this Chapter.

Although each region has specific priorities and areas of concern, their mission statements all have common goals and objectives as described below:

GOALS

1. Provide education materials and programs regarding general groundwater protection.
2. Promote the use of groundwater protection "tools" to county and other local units of government that implement groundwater protection programs throughout the region.
3. Assist the state jurisdictions in accomplishing specific regional groundwater protection programs.
4. Provide a forum for the development of recommendations that address committee recognized regional protection needs.

OBJECTIVES

1. Maintain an on-going general education subcommittee to work with citizen groups, schools, governing agencies and other interested parties on the importance of groundwater protection.
2. Promote the use of voluntary P2 programs for businesses and residences located within groundwater recharge areas.
3. Work with county, municipal, and other special units of government to implement groundwater protection tools such as local zoning, maximum setback zones, technology control regulations, and defining regulated recharge areas.

STRATEGIES

1. Act as a catalyst for implementation of groundwater protection tools including meeting one on one with local officials and businesses.
2. Conducting workshops for education and assistance.
3. Develop and distribute a newsletter.
4. Annual self evaluation review of program effectiveness.

During the past two years, the Illinois EPA and members of the Priority Groundwater Protection Planning Committees have met with local stakeholders to encourage the development of groundwater protection programs and to implement activities to protect CWS recharge areas. One of the most effective methods of encouraging local groundwater protection programs is through direct meetings with local stakeholders. The following information provides a summary of community programs that the regional committees have targeted for groundwater protection efforts.

Northern Groundwater Protection Planning Region (Winnebago, Boone, and Mc Henry counties)

- The Northern Groundwater Protection Planning Committee has assessed their efforts, and the following provides a summary of these actions:

Rockton - Illinois EPA staff and members of the planning committee continue to assist in the implementation of a local groundwater protection project in the village of Rockton's CWS well recharge area. With assistance from the IRWA, the village is in the process of establishing maximum setback zone protection for their CWS wells. Further, a pilot targeted aquifer protection project was undertaken by the Winnebago and Boone County Soil and Water Conservation District (SWCD) offices. Letters were mailed to over 40 agricultural producers farming within the recharge area for Rockton's wells inviting them to a groundwater protection workshop. As part of this workshop, farmers were introduced to the Illinois Farm-A-syst program, including a Farm-A-syst package. In addition, participants were provided one-on-one assistance in filling out the worksheets as part of the farmstead assessment. Three farmers completed the package as a result of the workshop. Cost share funds are now being considered by the county Soil and Water Conservation Districts ("SWCD's"), the Northern Groundwater Committee, and others to help promote this program within the area and to assist farmers in remediating identified potential risks to ground water.

North Park PWD - The North Park PWD continues to implement local groundwater protection efforts by participating in the Groundwater Foundation's National Groundwater Guardian Program. The North Park PWD has purchased additional road signs to enhance previous IDOT efforts. In addition, the water district is attempting to follow-up on previous pollution prevention ("P2") efforts by encouraging other local industries in participating in the P2 internship program.

- *Loves Park* - During the spring of 1998, efforts to enhance the City of Loves Park wellhead protection program were undertaken. A partnership was formed between the City, an environmental science class at Rock Valley College, Winnebago Retired and Senior Volunteer Program (RSVP), Illinois EPA, and the Illinois Department of Public Health. A three phase project was designed. The first phase of the project included the updating of the potential source of contamination inventory with a survey including the full 10-year capture area for the City's wells #1 and #2. Students from Rock Valley College also utilized global positioning equipment ("GPS") to obtain latitude and longitude locations for every potential source of contamination. In total, the teams of students and senior volunteers identified 69 businesses within the City's wellhead protection areas. Work is still planned to complete the other phases of the project. On-site interviews, educational outreach to businesses within the recharge area and the development of recommendations for further management approaches will be included as future directions to this project.
- *Marengo* - Significant progress continues to be made by the City of Marengo. On May 11, 1998, the City Council adopted the Groundwater Protection Ordinance to protect the City's water supplies. The ordinance establishes a groundwater protection overlay zone which includes special/conditional use permits for new and existing businesses handling certain types and quantities of chemical substances within the CWS's recharge area. A Groundwater Protection Team, established by the ordinance, is beginning to implement elements of the permit program. In recognition of the significant progress made in protecting groundwater, DNR designated the city of Marengo as a Shining Star community for 1999.
- *Crystal Lake* - The city of Crystal Lake hired a local consulting firm to delineate the 5-year recharge areas for their seven unconfined wells. This was done as part of the requirements for obtaining a SDWA monitoring waiver. During 1998, Crystal Lake agreed to participate in the pilot Source Water Mentor Initiative program. Students from Prairie-Ridge High School in Crystal Lake and senior volunteers from the Kane/McHenry County RSVP completed the inventory of potential sources of contamination within the delineated wellhead protection areas ("WHPA"s). Students and Senior volunteers worked in teams to develop and distribute brochures to the public. This heightened awareness about potential risks to groundwater within the community. The outcome of this project included a presentation to the city staff and administration on actions they could take to reduce the risk of contaminating groundwater. Furthermore, the Illinois EPA in coordination with the Northern Groundwater Protection Planning Committee funded a Pollution Prevention intern. This intern augmented the initial work by doing additional potential source of groundwater contamination inventories and made recommendations for source reduction/waste minimization alternatives to local industries.

Another P2 intern was placed with the City of Crystal Lake during the summer of 1999 to supplement the previous interns recommendations. Road signs have also been posted alerting travelers when they are entering and leaving the wellhead protection areas. The City has drafted a groundwater protection ordinance that would establish special/conditional use permits for certain types of commercial/industrial uses located within the CWS recharge area.

- Woodstock - Students from Woodstock Highschool's environmental science classes have undertaken activities to promote the protection of the City's water supply. During 1998, the Source Water Mentor Initiative project was initiated in Woodstock. This led to a partnership between the students of Woodstock High school and the senior volunteers from the Kane/McHenry RSVP office. Teams of students and senior volunteers completed the potential source of groundwater contamination process for Woodstock's two well fields. As this work was completed, the volunteers handed out brochures highlighting the importance of protecting groundwater. The inventory process resulted in the identification of a number of potential sources of groundwater contamination. The students developed a list of 20 recommendations that the city could take action on to reduce the risks to their water supply. Woodstock is now working with Illinois EPA under the SDWA monitoring waiver program to develop a management plan to protect their water supply. Most recently, road signs have been posted alerting travelers when they are entering and leaving the wellhead protection areas.
- Cary - Following the delineation of the village of Cary's well recharge areas, by a local consulting firm, work has been initiated to establish regulatory controls within these appropriate areas of concern. The village has requested that the Northern Groundwater Protection Planning Region recommend to the Illinois EPA that there is a need for a regulated recharge Area Regulatory proposal. Upon completion of this process, the Illinois EPA will determine the technical feasibility of this proposal for referral to the IPCB.

Northeastern Groundwater Protection Planning Region (Kane, Kendall, Will, and Kankakee counties) - The Northeastern Groundwater Protection Planning Committee has assessed their efforts, and the following provides a summary of these actions:

- St. Charles - The city of St. Charles has developed a program to protect its water supplies. With the assistance of a local engineering firm, the city developed a Groundwater Protection Study and Plan in May, 1996. The city has adopted a groundwater ordinance which regulates certain types of new land uses within the well's recharge areas. Furthermore, the city of St. Charles continues to implement local groundwater protection efforts by participating in the Groundwater Foundation's National Groundwater Guardian Program.
- East Dundee - The Village of East Dundee's groundwater protection program was enhanced under the pilot Source Water Mentor project. During 1998, the Source Water Mentor Initiative project was initiated in East Dundee. This led to a partnership between the students of Dundee-Crown Highschool and the senior volunteers from the Kane/McHenry RSVP office. In teams of students and senior volunteers, a potential source of groundwater contamination inventory was completed

for the areas designated by the 5-year capture zones. The teams identified 30 potential sources of groundwater contamination and the students developed a video highlighting the project and their recommendations for action. The East Dundee Utility Board used these recommendations to develop a plan of action under the National Groundwater Foundation's Groundwater Guardian Community program. Activities in support of public education and regulatory control were then established. These efforts led to the adoption of a local groundwater protection ordinance. In addition, to raise public awareness road signs have been posted along State highways intersecting the city's recharge areas.

- **Plano** - The city of Plano continues to work with the Illinois EPA to augment their wellhead protection program. Local initiatives include efforts with the IDA and Kendall County Soil Water Conservation Office. A pilot project which targeted area farmers within the city's recharge areas was developed. The Northeastern Groundwater Protection Planning Committee and the city provided financial resources for an education and assistance program designed to reduce the potential for contamination to groundwater. The Illinois EPA and the Regional committee also funded a graduate level P2 intern who completed a project at the Plano Molding Company, a plastic-resin injection molding processor. The intern developed a hydraulic oil recycling program and evaluated management programs for the on-site containment/control of resin pellets. In addition, to raise public awareness road signs have been posted along State highways intersecting the city's recharge areas.
- **Sugar Grove and Prestbury** - Recharge area delineations were completed for the village of Sugar Grove and Sugar Grove-Prestbury. Since the last report, Sugar Grove-Prestbury has been connected to the Village of Sugar Grove and is operated and maintained as one system. The Village retained the services of a local engineering firm to assist in completing the technical components of a wellhead protection program. The report was completed in May, 1996 and summarized the recharge areas and potential sources of groundwater contamination. The engineering firm also recommended that the village adopt a groundwater protection ordinance. This ordinance was adopted by the Village Board on October 20, 1997. The Village also properly abandoned five inactive wells that were potential routes of groundwater contamination.

Central Groundwater Protection Planning Region (Peoria, Tazewell, Woodford, and Mason Counties) - The Central Groundwater Protection Planning Committee has assessed their efforts, and the following provides a summary of these actions:

Pekin - The Central Groundwater Committee continues to work with the city of Pekin in the development and implementation of a comprehensive local groundwater protection program. The city of Pekin's groundwater protection program includes both regulatory and non-regulatory/public education components. Pekin adopted and implemented a comprehensive recharge area overlay protection ordinance and maximum setback zone ordinance in January 1995. The overlay zoning ordinance has been used in the development of several site plans for new and existing businesses. The Pekin's Inspection Department has incorporated requirements of the ordinance into part of the building permit process. This Groundwater protection ordinance has served as a model for several other communities in the state.

The city of Pekin's Groundwater Protection and Education Committee continues to participate in the Groundwater Foundation's Groundwater Guardian program by implementing "Result Oriented Activities" for local groundwater protection. This year, one of these activities included a storm sewer stenciling project with area school children. Several students stenciled storm sewers with the message "Dump no waste, Drains into our Illinois River". In addition, the city coordinated with the Tazewell County Planning and Zoning Department to adopt a county-wide groundwater protection ordinance that will protect a portion of Pekin's CWS recharge area located in the county's jurisdiction. In addition, the Public Works Department purchased several "Water Supply Protection Area" road signs that were posted on secondary roads indicating the boundaries of the city's CWS recharge areas.

Pleasant Valley PWD - The Illinois EPA, with input from the regional committee, continues the development of a regulatory management program for the Pleasant Valley PWD well recharge areas. The Central Committee initiated the regulatory management program when it officially petitioned the Illinois EPA to proceed with the development of a regulated recharge area rulemaking proposal to the IPCB. Since that time, the Illinois EPA has developed a draft regulation that includes provisions for: differential management between existing and new potential sources; chemical substances registration, management, and reporting procedures; an employee training requirement; and design and operating criteria. A framework based on the Illinois Chemical Safety Act was also used, and a concept of threshold quantities was incorporated. In addition, the draft regulations would prohibit certain types of new potential sources. Currently, the draft regulated recharge area proposal is being reviewed by Illinois EPA legal staff prior to making a formal petition to the IPCB.

East Peoria - The water supplies for the city of East Peoria, the village of Mackinaw, and Peoria Heights are drawn from the Sankoty Aquifer. Since this aquifer is unconfined in valley areas, potential groundwater contamination is a concern. An Illinois EPA pollution prevention(P2) intern was placed with the Tazewell County Health Department during the summer of 1999 to continue the work of an intern that was placed at the department the previous summer. This intern performed waste minimization opportunity reassessments for five East Peoria businesses and performed waste minimization opportunity assessments for 18 East Peoria businesses, five Mackinaw businesses, and two businesses in the Peoria Heights recharge area. It was discovered in a reassessment that one business was saving approximately \$7,800 per year in pallet pick-up costs as a result of actions taken according to a recommendation made by the previous P2 intern. Other positive results were found during the reassessments of other businesses. The 1999 intern began the processes for both East Peoria and Mackinaw to become Groundwater Guardian communities, developed several groundwater protection related senior project ideas for East Peoria High School teachers, and encouraged the city of East Peoria to evaluate local groundwater protection programs.

Tazewell County - The Central Committee, with assistance from Illinois EPA staff, coordinated with the Tazewell County Planning and Zoning Department to develop a county-wide groundwater protection ordinance. The intent of this ordinance is to assist CWS's in the county by providing them a "generic" groundwater protection ordinance that can be adopted by local municipalities. In addition, this ordinance would cover recharge areas that extend outside of local corporate limits, where the county is responsible for land-use planning. Much of the "generic" ordinance is based on the city of Pekin's groundwater protection overlay zone, which addresses many of the same groundwater protection issues and concerns that the county has. The groundwater protection ordinance was presented to the Tazewell County Zoning Board of Appeals on November 4, 1997, and was formally adopted by the Tazewell County Board on April 29, 1998.

Southern Groundwater Protection Planning Committee (Madison, Monroe, St. Clair, and Randolph counties) - The

Southern Groundwater Protection Planning Committee has assessed their efforts, and the following provides a summary of these actions:

Edwardsville, Troy, and Roxana - The Illinois EPA and the regional committee have completed a pilot program that addressed agricultural nonpoint source BMPs in the community recharge areas of

The pilot program that addressed agricultural nonpoint source BMPs in the community recharge areas of Edwardsville, Troy, and Roxana. With assistance from the Madison County SWCD and certified crop advisors, incentive payments were provided to farmers who implemented the following BMPs:

- nutrient and pesticide management plans;
- integrated pest management techniques;
- soil testing for nitrogen and nutrients;
- weed and pest scouting programs;
- buffer strips and/or grassed waterways; and

Edwardsville, Troy, and Roxana. With assistance from the Madison County SWCD and certified crop advisors, incentive payments were provided to farmers who implemented the following BMPs:

- nutrient and pesticide management plans;
- integrated pest management techniques;
- soil testing for nitrogen and nutrients;
- weed and pest scouting programs;
- buffer strips and/or grassed waterways; and
- winter cover crops.

The results of this two year initiative are being promoted by the Illinois Farm Bureau, the Conservation Technology Information Center, and the Illinois Association of Soil and Water Conservation Districts.

Collinsville - The city of Collinsville continues to actively implement a local groundwater protection and management program through state and local partnerships. Collinsville has adopted maximum setback zones for wells within their municipal boundaries. This includes the community water supply wells which supply both the city of Collinsville and village of Troy. This is one of the first instances in Illinois where one community has adopted maximum setback zones on behalf of another.

Bethalto - The village of Bethalto with assistance from the Southern Regional Groundwater Protection Planning Committee has published a groundwater protection brochure. This Brochure is designed to educate the general public as well as businesses within the recharge areas of the community water supply. Furthermore, the village of Bethalto continues to implement local groundwater protection efforts by participating in the Groundwater Foundation's National Groundwater Guardian Program.

The village is also in the process of developing a regulatory management program for groundwater protection. This effort is proving to be challenging because most of the recharge area for the village's wells are located in the municipal jurisdiction of Wood River and East Alton. Therefore, a regulatory based groundwater protection ordinance or management program will have to rely on implementation by the Wood River and East Alton city governments. The Village Board is currently working to establish an intergovernmental agreement with the other two villages to accomplish this goal.

Section 6. Continue to implement groundwater protection programs for CWS and assist with targeting local contacts and interest groups

The Illinois EPA is the primary Agency responsible for implementing this groundwater protection goal. As part of Illinois' U.S. EPA approved wellhead protection program, Illinois must document and report, on a biennial basis, the implementation status for CWS groundwater protection programs. This reporting frequency coincides with the IGPA Report and is available upon request.

Section 7. Continue integration and implementation of the WHPP under SDWA new alternative monitoring program

The Illinois EPA has also made significant progress in achieving local management programs by incorporating Well Head Protection Area ("WHPA") management into the SDWA vulnerability waiver program. Under the WHPP, a WHPA area is defined, and the potential sources of groundwater contamination are inventoried within this area. Following these steps, local stakeholders are involved in developing and implementing WHPA management plans. Given the natural geologic protection and/or management plans in these WHPAs, the vulnerability to contamination can be reduced or eliminated. To date, the Illinois EPA has received waiver applications from over 760 CWSs. Approximately 605 of these facilities received a monitoring waiver through Illinois EPA endorsement of their WHPA management/protection plans.

Section 8. Finish the delineation of recharge areas for CWSs using reasonably available information

The Illinois EPA has been delineating the five-year recharge area of CWS wells utilizing unconfined aquifer systems. Historically, completion of these delineations have focused on CWS's located within Illinois' Priority Groundwater Protection Planning Regions, and under a vulnerability monitoring waiver program

developed under the SDWA. There are approximately 144 communities that still require this delineation to be performed. The Illinois EPA plans to utilize four public universities, with graduate hydrogeology programs, to complete the delineations for 111 of these communities.

The 111 CWS's have been broken out into four regions with a university assigned to each region. The universities will provide maps in electronic format with modeling output referenced to real world coordinates to allow for integration with the Illinois EPA's Arc/Info Geographic Information System (GIS). The Illinois EPA will be completing the delineations for the remaining 33 CWSs.

Section 9. Modify CWS water well construction permit application procedures to include collection of information on potential sources and routes, well logs, pumping tests and chemical analyses

Illinois EPA has targeted new wells for establishing groundwater protection programs by enhancing data collection during the new well construction process. When drilling a new well, a CWS has the opportunity to obtain information needed to establish groundwater protection programs. In an effort to further the development of groundwater protections programs for new CWS wells Illinois EPA developed an informational pamphlet entitled "Wellhead protection for New Community Water Supply Wells" and provides a copy of this brochure to each facility making application for a new well. The purpose of this brochure was to encourage CWSs to obtain the data needed for them take proactive steps to protect their source of water and the money invested to construct the new well. Illinois EPA will use the this new well data to delineate the recharge areas and provide technical assistance for establishing maximum setback zones. The brochure explains the benefits of protecting new wells from certain nearby high risk activities, and also contains four steps for the community water supply to follow during the well permit procedure:

- Step 1 Prior to issuance of a permit an inventory of potential sources and routes of contamination within 1,000 feet of the proposed well location, is required.
- Step 2 Yield and drawdown tests must be performed on the production well after construction or before permanent pump placement.
- Step 3 The Illinois EPA should be supplied be supplied the pump test information and additional data gathered that is specific to the well development.
- Step 4 Organic and inorganic chemical testing is required for the community water supplies applying for the Safe Drinking Water Act Phase II, II(b) and V monitoring waiver program.

The information covered in the brochure parallels the information needed in the well construction permits. Follow-up letters are being sent to communities that have not provided this well information.

CHAPTER VII. REGIONAL GROUNDWATER PROTECTION PLANNING PROGRAM

Section 1. Assist with conducting and supporting both new and follow-up efforts of encouraging local groundwater protection programs

As previously described in Chapter VI, the Illinois EPA is the primary agency responsible for developing and implementing this program. To date, the Illinois EPA has had some success related to the establishment of this activity. However, there is still much to be done.

The regional groundwater protection process has resulted in successful local coordination and outreach efforts that have benefitted both private citizens and businesses in these high priority areas of the state (e.g., P2 interns, Groundwater Protection Field Days, well sealing demonstrations, etc.). Cooperative efforts with entities such as the Groundwater Guardian program will assist the regional groundwater protection process by providing national attention

Groundwater Guardian Communities are committed to preparing new “result oriented activities” each year. This program will assist with measuring the long-term success of local source water protection efforts. Illinois currently has 10 Groundwater Guardian Communities, second only to Nebraska the home state for the Groundwater Foundation. Illinois EPA will continue to promote these activities.

and recognition to CWS developing groundwater protection programs. Illinois EPA worked with the Groundwater Foundation to pilot a new program referred to as the “Groundwater Guardian Affiliate” program. The Illinois EPA worked with each of the four Priority Groundwater Protection Planning Regions to become Groundwater Guardian Affiliates and to commit to a series of “result oriented services.” These result oriented services include working with communities within their respective regions to implement local source water protection programs and become Groundwater Guardian Communities.

Illinois EPA has successfully implemented the pilot “Source Water Protection Mentor Program” with the U.S. EPA Region V. In 1997 Illinois became one of nine states across the country to pilot the use of retired senior volunteers to promote local drinking water protection programs. At least four additional communities have actively participated in the protection of their drinking water sources (this is in addition to the original two communities). The volunteers conducting these projects have made recommendations which have led to many positive groundwater protection initiatives.

The pilot Illinois Source Water Mentor initiative, began in 1997 with a workshop for ten retired senior volunteers from the Kane/ McHenry and Winnebago county Retired Senior Volunteer Program (“RSVP”) Chapters. During year one of the pilot, the Kane/McHenry County RSVP worked with local environmental science classes in the communities of East Dundee, Woodstock and Crystal Lake. The Winnebago county RSVP chapter assisted farmers within the recharge areas of the Rockton CWS wells. With the assistance

of Rock Valley Community College the Winnebago RSVP also assisted Loves Park to develop local wellhead protection programs.

During the second year of the pilot, the RSVP made several presentations to local schools relating to groundwater science and drinking water protection programs. As a result of the pilot initiatives undertaken

and the positive outcomes of the projects, students have gained experience and awareness of local environmental issues which may lead to better stewardship in their adult lives. Furthermore, as a result of the success of the pilot projects, at least four additional communities have initiated local source water protection programs and funding has been secured for a third year. Future efforts will include promoting the approaches gained from this effort in other priority groundwater protection planning regions in Illinois.

Other activities conducted by the Regional Groundwater Protection Planning Committees to support both new and follow-up efforts of encouraging local and regional groundwater protection programs are summarized below:

NORTHERN GROUNDWATER PROTECTION PLANNING COMMITTEE

The Northern Committee accomplished a number of tasks over the past two years. The two main goals were identified by the Committee: public education, and local government assistance.

In addressing the first goal, the Committee evaluated various ways to most effectively educate the public. The Committee has facilitated public education through participation in several public forums. The first forum was the Winnebago County Field Day held at Klehm Arboretum and Botanical Gardens. Another educational opportunity was presented at the Farm Show Expo held in Rockford. The Committee also sponsored a Field Day Educational Seminar in McHenry County at McHenry Community College. The committee co-sponsored another program on groundwater protection: The Youth Groundwater Festival held at Rock Valley Community College in Rockford with the League of Women Voters, Winnebago County Health Department, the Retired Senior Volunteer Program and Burpee Museum of Natural History.

The second goal, local government assistance, was an effort to work with local governments and water supplies to assist them with groundwater protection programs. The Committee worked with the Illinois EPA to employ three P2 intern projects. The first P2 intern worked with the McHenry County Defenders in Woodstock. The goal of this project was to develop industry-specific P2/waste minimization fact sheets for area businesses located in the village of Crystal Lake's wellhead protection area. A second P2 Intern assisted with finalization of the fact sheets and also worked to promote P2 alternatives with a few industries located within Crystal Lake five-year recharge area. The goals of this project were to: evaluate alternatives to replace current in-house processes, reduction and recycling of products used in manufacturing, and recommend environmentally safer chemical substitutions. The third P2 project focused on investigating basic information and providing follow-up activities for several industries within the recharge area of Crystal Lake's CWS wells. The Northern Committee continues to form partnerships with the League of Women Voters, Retired Senior Volunteers, high school students, and the City of Loves Park and the Village of Rockton to conduct door-to-door survey's of potential sources of groundwater contamination.

NORTHEASTERN GROUNDWATER PROTECTION PLANNING COMMITTEE

The Northeastern Committee has accomplished a number of tasks over the past two years. The strongest impact the Northeastern Committee has made in the area of ground water education.

The committee successfully completed a pilot project modeled after the Illinois Middle School Groundwater Education program by partnering with the Kane County Regional Office of Education. The project culminated in a workshop for Kane County middle and high school teachers on February 6, 1998. On March 19, 1999, the project was repeated in Will County. Between the two county workshops nearly 100 teachers were introduced to Illinois' ground water curriculum, H2O Below, and were provided a ground water model and other tools to bring ground water education into the classroom. Planning has already begun to host another workshop for Kendall-Grundy county teachers in March, 2000. As a result, the committee has been successful in adopting this ground water middle school program throughout the Region.

Other ground water education activities held by the Northeastern Committee include:

- the "Groundwater Protection Field Day" held in Kankakee on Saturday, May 1, 1999 which focused on educating the general public and promoting the Home ACRE package;
- a workshop held in November, 1998 targeted at water supply operators and local officials which highlighted the work of 8 communities in northern Illinois who were taking action to protect their drinking water supplies;
- the development of a ground water resource lending library and Internet sites for teachers to access; and
- ground water educational presentations by the Kane/McHenry County Retired and Senior Volunteer Program (RSVP) volunteers at area schools as part of the Source Water Mentor Initiative pilot project.

CENTRAL REGIONAL GROUNDWATER PROTECTION PLANNING COMMITTEE

The Central Committee has accomplished a number of activities over the past two years. These activities can be broadly categorized as: public education, and local government/business assistance. After two years of working to develop a County Groundwater Protection Ordinance, Tazewell County formally adopted an ordinance on April 29, 1998. The city of Pekin had adopted a similar Groundwater Protection Ordinance in 1995, but a portion of Pekin's community wells recharge areas extended beyond the city's boundaries. The passing of this ordinance will help to protect the quality of water from these wells and other groundwater protection zones within the county. The Education Subcommittee has also developed a web page to advocate region-specific groundwater protection issues. Copies of the city of Pekin and the Tazewell County Groundwater Protection Ordinance can be found on the Central Region Groundwater Protection Committee's web site at <http://www.dpc.net/crgw>.

The Central Committee, with assistance from the Illinois EPA has also been able to provide P2 Interns to work with local business' within the region. To date, two interns have worked out of the Tazewell County Health Department to conduct waste minimization assessments for local businesses within recharge areas of community water supply wells. This effort has proven to be an extremely successful program with 34 businesses having assessments completed over a two year period.

To help measure the effectiveness of the first year intern recommendations, five local business agreed to participate in re-assessments during the second year.. During the re-assessment, it was found that all

businesses had implemented one or more of the recommendations from the original assessment. The use of P2 Interns to conduct waste minimization assessments in recharge areas has been very beneficial as the majority of businesses in these recharge areas are small and have no one knowledgeable in pollution prevention alternatives.

The Education Subcommittee continues to be very active in promotion of groundwater protection awareness programs throughout the region. This year the committee has worked with the Illinois Department of Agriculture on promoting the HomeACRE program. The Education Subcommittee has co-sponsored three meetings to promote and educate citizens about this program. One of these meetings included training nearly 100 Pekin High School chemistry students on the HomeACRE program and getting them to do assessments at their home. Some of these students also participated in stenciling storm sewers in the city of Pekin with "Dump no waste, Drains into our Illinois River". The U of I Cooperative Extension has been a major player and has worked with the committee on promoting the HomeACRE program. In addition, the committee continues to sponsor low cost water screening analysis for private well owners.

The committee continues to participate in the Groundwater Foundations, "Groundwater Guardian Affiliate" program. The committee annually develops Result Oriented Services which provides support to the Groundwater Guardian Community of Pekin. The committee also continues to have annual Groundwater Protection Recognition Awards. These awards are given in three different categories: Teacher, Student, Individual and Community. Nominations are taken and selections are made by the Groundwater Education Subcommittee.

SOUTHERN REGIONAL GROUNDWATER PROTECTION PLANNING COMMITTEE

The Southern Committee continues to be very active in promoting groundwater protection activities within the region. The mission of the committee is to advocate groundwater protection practices throughout the Southern Planning Region. To assist in fulfilling this mission, the committee developed an annual work plan. The purpose of this work plan is to assist the Southern Committee in prioritizing the implementation of groundwater protection education and outreach efforts within the region.

A major groundwater quality concern within the Southern Groundwater Protection Planning Region relates to the Illinois Sinkhole Plain. This environmentally sensitive area covers approximately 1,228 square miles in southwest Illinois, including much of Monroe and St. Clair counties, and portions of Randolph and Madison counties. To heighten awareness of this vulnerable area, the Southern Committee sponsored a Karst Groundwater Field Day, on May 14, 1999, in Monroe County. A total of 74 people visited several Karst areas. These included a subdivision being developed in a sinkhole plain with innovative onsite wastewater treatment system, a sinkhole stabilization project, and a tour of the Illinois Caverns.

An education and outreach campaign is underway to develop materials to promote groundwater protection to various county and local governmental agencies. The committee has an interest to encourage local stakeholders to become aware and active in groundwater protection strategies throughout the southern region. To assist with this effort, the committee provided funding assistance to the Village of Bethalto to

develop and print the “Bethalto Groundwater Planning Brochure” that is distributed to citizens and commercial businesses that are in the protection zone of Bethalto’s public water wells

In addition, the committee is developing community outreach tools. These include, a lending library of groundwater education materials and piloting the HOMEACRE program. Both are attempts to foster community involvement in programs that protect this resource, such as the Groundwater Guardian Program. The committee is an affiliate of the Groundwater Guardian Program.

Section 2. Evaluate the development of regulated recharge areas for the karst areas of Monroe and St. Clair counties

The Southern Regional Groundwater Protection Planning Committee, with technical assistance from IDNR and Illinois EPA, is currently completing an education program on the vulnerability issues related to the Illinois Sinkhole Plain, including portions of Monroe and St. Clair counties (see Section 1 of this Chapter). Following this initiative, the planning region will determine the appropriate “next steps” in the protection of the shallow groundwater in these areas. Furthermore, the regional planning committee has initiated coordination between Illinois EPA and IDOT to establish a road sign project identifying this vulnerable region.

Section 3. Assist with coordination of Section 319 grant best management plan implementation for nonpoint sources of contamination within community well recharge areas

The Illinois EPA linked watershed and wellhead protection boundaries to assist with targeted implementation of the Illinois Farm-A-Syst program that was developed utilizing Clean Water Act Section 319 funding. This pilot program coordinated community wellhead protection programs with the IDOA Farm-A-Syst initiative. Illinois’ Farm-A-Syst program was developed by the IDOA to assist rural farmstead owners with evaluating groundwater contamination potentials by assessing natural and management conditions relative to well location. The Illinois EPA generated GIS based maps to link watershed boundaries with delineated wellhead protection boundaries located within priority groundwater protection planning regions. A funding agreement between Illinois EPA and IDOA was developed to pilot this effort within three community water supply wellhead protection areas. These areas include the village of Rockton, city of Plano and village of Newton. This program resulted in best management practice to reduce the threat of groundwater contamination within these three highly vulnerable area. The Illinois EPA anticipates that these models will be useful in promoting this type of voluntary management strategies on a statewide basis.

In addition, the Illinois EPA and IDOA continued this project through the HomeACRE publication. This document and associated training initiative are intended to assist non-farm residences who are willing to take steps to reduce the potential risks to groundwater. This program is a confidential self-assessment that can be used to evaluate home and property for health and environmental risks. The Illinois EPA also secured Clean Water Act Section 319 funding to develop nonpoint source management programs within the community water supply well recharge areas of the cities of Edwardsville, Troy and Roxana (see Chapter VI, Section 5).

Section 4. Continue to develop and integrate a source water assessment protection program

On February 1, 1999, the Illinois EPA submitted an application for a source water assessment program (“SWAP”) which received preliminary approval on June 2, 1999. The SWAP Application was developed by the Illinois EPA with consensus of the Source Water Protection Citizens and Technical Advisory Committee. This application built upon, and at times closely mirrors, Illinois’ approved WHPP. The main elements of Illinois’ SWAP include: delineations of source water assessment area boundaries for all public water supplies; inventory existing and potential sources of contamination within those boundaries; providing an analysis of the susceptibility of the water systems to contaminants; and defining a process for making the assessments available to the public.

Section 5. Coordinate with watershed protection initiatives and groups

Illinois EPA will continue to work with the Natural Resource Conservation Service, Soil and Water Conservation Districts, and other local stakeholders to establish conservation reserve programs for agricultural cropland located within CWS phase one and two wellhead protection areas. A set of new county-level maps has been developed to assist with this effort. The Illinois EPA will also continue to work with the Illinois Department of Agriculture (“IDA”), Illinois Association of Soil and Water Conservation Districts, and the County Soil and Water Association Districts to implement Farm-A-Syst in targeted aquifer protection areas. Furthermore, Illinois EPA has appointed a citizens and technical advisory committee that includes individuals who have expertise in watershed protection initiatives. These representatives have provided input on the development of source water assessment and protection fact sheets for both ground and surface water public water supplies. These fact sheets are being designed to assist local stakeholders in prioritizing protection programs within recharge and watershed areas.

Section 6. Coordinate with the Clean Break Program and utilize P2 technical assistance in creating community based groundwater protection programs

Illinois EPA with the assistance of the regional groundwater protection planning committees continues to promote the clean break and pollution prevention programs to businesses located within CWS well recharge areas (refer to Chapter VI Section 5).

Section 7. Designate one new regional planning area and associated committees

In the previous IGPA Biennial Report, the Illinois EPA and ICCG committed to designating an addition regional groundwater protection planning area in the northwestern part of the state. As a result of staff resource constraints the Illinois EPA did not meet this objective. Staff resource limitations resulting from new and enhanced program requirements/commitments, such as the targeted watershed and source water protection programs, led to this delay.

While Illinois EPA recognizes that this is an important program element and that an existing environmental concern committee (a subcommittee of the Blackhawk Hills Resource Conservation and Development Area) exists in this area, the Illinois EPA does not expect that this goal will be met within the next reporting

period. However, Illinois EPA will make every attempt to coordinate with the environmental concerns committee representing Jo Daviess, Stephenson, Whiteside, Ogle, Lee and Carroll counties on source water protection initiatives. Illinois EPA will also provide technical and outreach support to community water supply stakeholders within this area.

Section 8. Develop up to five maximum setback zone proposals in coordination with the ICCG and GAC

The Illinois EPA has developed a maximum setback zone proposal for 13 community water supply wells in the central groundwater protection planning region. A regulator development workshop will be held in the year 2000 to provide for stakeholder input prior to presenting a proposal to the Board.

CHAPTER VIII. NON-COMMUNITY AND PRIVATE WELL PROGRAM

Section 1. Continue to implement the WHPP, and assist with implementing the technology control and groundwater quality standards regulations;

IDPH has primary responsibility for inspections of approximately 4,100 non-community water systems which are performed at least once every two years. At the time of these inspections, the area surrounding the wellhead is inspected for sources of contamination. Permits for the new construction, modification or an extension of an existing non-community water system will continue to be required.

Section 2. Continue the issuance of potable and other water well permits;

Approximately 7,000 permits to construct private, semi-private, non-community and non-potable water wells are issued annually by IDPH and approved local health departments. All new wells are inspected to ensure that location and construction specifications have been met as per requirements of the Illinois Water Well Construction and Pump Installation Codes.

Section 3. Continue implementation of the groundwater monitoring well, closed loop heat pump and backflow prevention code;

In 1994, the Illinois Water Well Construction Code was amended to include requirements pertaining to grouting and the sealing of abandoned wells. The requirements for monitoring and closed loop heat pump wells remain in effect. The Illinois Water Well Pump Installation Code requires a backflow device where a chemical injection system is connected directly to a water well used for irrigation and which is not used as a potable water supply.

Section 4. Initiate digitizing the location of non-CWS wells, and create an electronic inventory of potential contamination sources using the Illinois EPA's CDBS database; and

Non-CWS wells will be digitized from registered aerial photographs which have had well location(s) drafted onto them. During the field survey for the well, potential sources of contamination within 1000 feet

are identified and drafted onto the photograph as well. Each site is described on a standardized coding form, and is then entered into Illinois EPA's CDBS database. As of July, 1999, 646 potential contamination sources have been entered into the database, with 534 of those already digitized.

Section 5. Create a statewide GIS coverage for non-CWS wells.

Presently underway, 152 of approximately 4800 non-CWS wells have been digitized in twenty counties as of July, 1999. This has been accomplished by taking aerial photographs which have been drafted with well location from field surveys, and registering them against the county roads coverage. Once registered, or in real world coordinates, the photos are displayed and the well location is digitized into a statewide coverage from its drafted location on the photograph.

NON-COMMUNITY WATER PROGRAM

Non-community program inspections and permits - Under the authority of the Illinois Groundwater Protection Act, Section 9, the Illinois Department of Public Health (IDPH) has primary responsibility for inspections, performed at least once every two years, of approximately 5,000 non-community water systems (non-CWSs). At the time of these inspections, the area surrounding the wellhead is inspected for sources of contamination. Water samples are collected from all non-CWSs and tested by certified laboratories for the presence of coliform bacteria and nitrate concentration. Approximately 90 permits are issued each year for the construction, modification or an extension of an existing non-CWS. Non-CWSs in Illinois serve a population of approximately 740,000 citizens. These are water systems that serve 25 or more people for at least 60 days per year. Examples are water systems that serve schools, restaurants, factories, power-generating stations, office buildings, campgrounds, state parks and rest stops, etc.

Non-transient non-community water systems - Of the 5,000 non-CWSs, approximately 500 are non-transient, non-CWSs. A non-transient, non-CWS is one that serves the same 25 or more individuals at least six months a year, such as schools and workplaces. About half serve schools. Under the Safe Drinking Water Act, there are 83 requirements regarding the testing of water samples for contaminants and treatment methods.

Source water assessments of non-community public water systems - Required by amendments to the Safe Drinking Water Act, IDPH is conducting source water assessments of all non-CWSs. Approximately 6,000 water wells and 38 surface water sources serve as the sources of water to these systems. These wells and surface supplies are being identified and evaluated as to their vulnerability to potential contamination from sources such as sewage systems, abandoned wells, buried fuel tanks and chemical storage areas. The vulnerability assessments conducted in the past were confined to an area within a 200 foot radius around the well. This new initiative expands that radius to 1,000 feet. The location of the wells and any potential source of contamination within this radius will be identified in a state wide GIS system.

This project brings together resources from the Illinois Department of Transportation (IDOT), Illinois EPA, local health departments, and IDPH. IDOT is providing maps of the area surrounding each supply and Illinois EPA will enter the data into a GIS data system. Beginning in 1998, the project will take three years

to complete. Federal funding through U.S. EPA is supporting this effort. Local health departments are being compensated from this fund for conducting the assessments. IDPH regional staff are conducting assessments at supplies in facilities licensed by the Department and located in counties where there are no local health departments.

Certification of non-transient, non-community water system operators - In accordance with amendments to the federal Safe Drinking Water Act and recent U.S. EPA drinking water regulations, all non-transient, non-CWSs must be operated by personnel who have attained training approved by the Department. Certified operators will be required to be re-certified every three years by attending a training session approved by the Department that addresses new technology and new drinking water regulations. Program staff are meeting with the Water Quality Association to develop the curriculum. That Association provides training to operators of small water systems and has developed materials and courses similar to the training that will be required for non-transient, non-community operators. Training sessions are scheduled to begin in early 2,000.

There are approximately 463 non-transient, non-CWSs which will need certified operators. IDPH is presently grand parenting the existing operators. Rule amendments have been proposed that will require all operators to attend this training or other training approved by the Department by January 1, 2,003. Congress has authorized a special fund to be used by states to pay for the cost of training of operators. If these funds are appropriated, the Department will apply for this special grant to pay for these costs and hire a person to coordinate the training program.

PRIVATE WATER PROGRAM

Issuance of potable and other water well permits - Approximately 6,700 permits to construct private, semi-private, non-community and non-potable water wells are issued annually by IDPH and 83 local health departments. All new wells are inspected to ensure that location and construction specifications have been met in accordance with the requirements of the Illinois Water Well Construction and Pump Installation Codes. Additionally, water samples from new wells are tested by certified laboratories for the presence of coliform bacteria and nitrate concentration. About 2,100 abandoned wells were sealed each year during the last two years and inspected by local health departments and IDPH to ensure that such wells were sealed in accordance with the Illinois Water Well Construction Code.

Continuing education requirements for licensed water well and pump installation contractors - Signed by the governor on August 7, 1998, House Bill 349 requires all licensed water well drillers and water well pump installation contractors to attend continuing education sessions by January 1, 2,000. In order to renew a license, a contractor must provide proof of attendance by that date. Thereafter, contractors are required to attend six hours of continuing education every two years and to submit proof such as a certificate from the training organization.

The new legislation requires plumbers who install or repair water well pumps and pumping equipment after January 1, 1999 (the effective date of the legislation) to obtain a pump installation contractor's license and to attend continuing education sessions before January 1, 2,000. However, plumbers are not required to take the water well and pump installation contractor examination or to pay the license fee. They are only required to make application for the license.

The training sessions, which must be approved by IDPH, are intended to increase a contractor's knowledge and to provide new industry information and updates, as well as to allow health officials to bring current problems to the attention of the industry. Topics for the 1999 sessions include the water well and pump installation codes, well grouting techniques, determination of costs, tanks and tank sizing, pitless adapters, water sampling and disinfection. Approximately 400 water well contractors and 1700 water well pump installation contractors, licensed by the Department, are required to attend these training sessions. Ten training sessions throughout the State during 1999 were conducted through the Illinois Association of Groundwater Professionals.

1998 Amendments to the Illinois Water Well and Pump Installation Codes - Amendments to the Illinois Water Well Construction and Pump Installation Codes became effective on April 1, 1998. The purpose of these amendments is to keep the codes up-to-date with current industry standards and to clarify existing requirements regarding water well construction and pump installation. There were a number of significant amendments and additions to both of these codes. In the construction of drilled wells, only bentonite grout and neat cement grout may be used to seal the annular space between the bore hole and the well casing. Natural clay may only be used in the upper annular space when the casing is mechanically driven. As a deterrent to the contamination of large diameter bored wells with buried slab construction, a bentonite seal, a minimum of 12 inches or more, is required to be installed over the buried slab. The minimum casing depth for driven wells was extended to 20 feet. Other amendments pertained to the extension of steel casing with plastic casing and the sealing of abandoned wells. Amendments to the Illinois Water Well Pump Installation Code established requirements for sampling faucets and piping material installed between a potable water well and the pressure tank.

As an additional initiative, proposed amendments to the Illinois Water Well Construction were first published in the Illinois Register on July 7, 1999. The more significant proposed amendments pertain to the grouting of drilled water wells, and the establishment of procedures to follow when abandoned dug and bored wells are sealed.

Training sessions for local health Department and IDPH water program staff - Water program staff from 83 local health departments and IDPH six regional offices attended a water well inspections seminar at six locations throughout the State. The sessions, presented through the Illinois Association of Groundwater Professionals, were approved by IDPH as meeting the annual water program training requirement for local health department water program staff under the Local Health Protection Grant Rules (77 Ill. Adm. Code 615). The seminar was developed as a practical guide for water well inspections beginning with the water well construction permit request and progressing step by step through the complete well construction process as specified in the Illinois Water Well Construction and Pump Installation Codes.

Summary - A survey of the quality of water drawn from domestic wells in nine midwest states - A report on the quality of water from private wells, completed in September 1998, was released by the Centers for Disease Control and Prevention (CDC). The Survey was conducted from May to November of 1994 by state health and environmental departments of Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota and Wisconsin through a grant from CDC.

Bacteria and chemicals associated with poor water quality were measured in water samples from 5,520 private water wells. Coliform bacteria, which indicates contamination from soil or surface water, were present in 41.3% and E. coli, which indicates contamination from human or animal waste, in 11.1% of the samples. Of the 818 private water wells sampled in Illinois, 44% tested positive for coliform bacteria and 16% tested positive for E. coli with dug (coliform bacteria 86%, E. coli 49%), buried slab (coliform bacteria 72%, E. coli 15%) and bored wells (coliform bacteria 65%, E. coli 12%) having the highest rates, respectively. In Illinois, the lowest rates were found in driven (coliform bacteria 16%, E. coli 2%) and drilled wells (coliform bacteria 23%, E. coli 3%). Nitrate was elevated (exceeded the standard of 10 milligrams per liter) in 13.4% of the samples in the nine state study area and 15.2% of the samples in Illinois. Atrazine and related chemicals were elevated in 0.2% of the samples.

In Illinois, atrazine was detected in 41% of the wells (compared with 13.6% in all the states sampled), but did not exceed the maximum contaminant level (MCL) in any wells; alachlor exceeded the MCL in only one sample.

Water samples from households with wells older than 25 years, shallower than 100 feet, or greater than six inches in diameter were more likely to have contaminants than samples from households with a newer, deeper, and smaller-diameter drilled or driven well. Water samples from households with bored or dug wells were 10 to 15 times more likely to contain coliform bacteria or E. coli than were samples from households with drilled or driven wells. The application of pesticides and fertilizers near the well were associated with coliform bacteria and E. coli, and high nitrate levels in the water samples.

Wells with pitless adapters and backflow devices had up to 20% fewer contaminated samples than wells lacking these devices. Samples from wells with a crack or hole in the well casing were up to 7 times more likely to be contaminated than were samples from wells with intact casings.

Of the 15,987 people who drank water from these wells, 2.9% reported having diarrhea during the 2 weeks prior to the collection of water samples for this survey. People who drank this water were no more likely to have diarrhea than people who drink water without these contaminants.

Copies of the report can be obtained by contacting the Illinois Department of Public Health, Division of Environmental Health, 525 W. Jefferson St., Springfield, IL 62761, telephone 217-782-5830, TDD (hearing impaired use only) 800-547-0466.

CHAPTER IX. GROUNDWATER QUALITY PROTECTION RECOMMENDATIONS AND FUTURE DIRECTIONS

The following groundwater protection efforts recommended for the next two years are based on the results of the self-assessment and environmental indicators presented in this report. In some tasks, the priority may be shifted due to funding constraints. The overall groundwater quality protection indicator shows that the overall progress of implementing the IGPA continues to be adequate. However, proactive groundwater protection measures for new CWS wells need to be improved. In addition, efforts and resources should continue to focus on critical regional recharge areas supporting unconfined CWS wells.

ICCG Operations

Continue to review and update the Implementation Plan and Regulatory Agenda;
Continue to hold quarterly meetings;
Provide liaison for the GAC;
Continue to assist with implementation of a fully-integrating CSGWPP vision statement and proposed changes in U.S. EPA policies and programs in support of the vision statement;
Oversee, review and provide input to the preparation and implementation of a generic SMP;
Review and support the annual groundwater education work plan;
Evaluate the development of Class III Special Resource Groundwater for Dedicated Nature Preserves;
and
Review regulated recharge area proposals.

GAC Operations

Conduct policy related meetings; and,
Provide input to programs, plans, regulatory proposals and reports as appropriate.

Education Program for Groundwater Protection

Coordinate and conduct a statewide education program with an annual evaluation and work plan involving local, regional and state organizations and agencies. Emphasize the integration of groundwater protection into state and local agency programs;
Support regional groundwater protection committees with special education programs based on regional needs. Increase emphasis on community programs for wellhead protection;
Through educational institutions and organizations, curriculum projects, and teacher workshops, integrate groundwater principles and groundwater protection into the curriculum for grades 3-12;
Community wellhead protection education. As groundwater recharge maps become available for community water supplies, provide educational assistance in developing community wellhead protection education programs;
Maintain an easily readable and useful newsletter and closely related electronic bulletin board for communication with newsletter editors, communicators, water professionals, committee persons, educators, and agency representatives with groundwater protection interests. Secure interesting articles from these clients for publication;
Target private well owners for educational programs involving licensed water well contractors, local health departments, and other organizations. These programs will address well abandonment, disinfection, testing, operation and maintenance methods;
Secure educational funding to expand the Illinois Middle School Groundwater Education Project to new state selected regional groundwater planning areas.

Groundwater Evaluation Program

Continue to share GIS coverages in an electronic format and continue to automate the groundwater resource data base for Illinois;
Continue to conduct groundwater assessments and share the information through regular updates and completed reports;

Continue to utilize innovative and cost effective methods to implement statewide groundwater quality monitoring; and
Continue to implement and improve overall groundwater quality indicators.

Groundwater Quality Standards and Technology Control Regulations

Evaluate the need to develop Class III: Special Resource Groundwater Standards;
Evaluate dedicated Nature Preserves for Class III designation;
Develop a proposed groundwater quality standard for MtBE;
Continue to implement and integrate the groundwater quality standards into environmental programs;
Continue to update and amend the groundwater standards to parallel the drinking water standards adopted by U.S. EPA;
Continue to implement preventive notice and response programs and integrate with environmental programs;
Continue to implement the technology control regulations and improve a database for tracking and evaluating compliance data;
Evaluation of activities located proximate to CWS where local groundwater protection management efforts are completed or in progress will be given priority;
Evaluation and compliance determinations for activities referred by permit programs will also be given priority; and
Continue cooperation between the Illinois EPA and the IDPH to provide statewide education seminars on the implementation of the technology control and groundwater standards regulations.

Wellhead Protection Program

Publish wellhead protection and assessment data on the Illinois EPA Homepage;
Increase the percentage of recharge acres with full protection progress established or under development (The goal is to increase the percentage of groundwater recharge areas (acres) with protection programs established or under development to 45% by the year 2005.);
Continue to implement and integrate the WHPP elements into protecting the regional groundwater sources for public water supply wells;
Develop and implement source protection criteria to use in the planning, construction and location of new community water supplies;
Continue to prioritize wellhead protection efforts within the Groundwater Protection Planning Regions;
Continue to implement groundwater protection programs for CWS and assist with targeting local contacts and interest groups;
Continue integration and implementation of the WHPP under SDWA new alternative monitoring program; and
Finish the delineation of recharge areas for CWSs using reasonably available information;
Modify CWS water well construction permit application procedures to include collection of information on potential sources and routes, well logs, pumping tests and chemical analyses.

Regional Groundwater Protection Planning Program

Current committee flexibility should be maintained while assisting with conducting and supporting both new and follow-up efforts of encouraging local and regional groundwater protection programs.

Non-community and Private Well Program

Continue to implement the WHPP, and assist with implementing the technology control and groundwater quality standards regulations;

Complete the source water assessments of all non-CWSs;

Complete GIS coverage for non-CWSs;

Begin certification training of non-transient, non-CWS operators;

Continue to inspect and perform laboratory analyses on water samples collected from non-CWSs;

Continue to issue permits for the construction, modification or extension of existing non-CWSs;

Continue the issuance of permits for all types of water wells with the exception of CWS wells;

Finalize and implement the amendments to the Illinois Water Well Construction Code initiated in 1999;

Continue continuing education training sessions for licensed water well and pump installation contractors;

Continue to conduct training sessions pertaining to both the non-CWS and private water program for local health department and IDPH water program staff.

APPENDIX 1 - List of ISGS Publications for the ICCG Biennial Report Publications from 1997 and 1998

Berg, R.C., D.A. Keefer, M. Demissie, and G. Rammamurthy, 1997. Regional Evaluation of Ground-Water and Surface Water Interactions: Preliminary Method Development and Analysis. Illinois State Water Survey Miscellaneous Publication 181, 29p.

Berg, R. C., D. A. Keefer, M. Demissie, G. Ramamurthy, and C. A. Job. 1997. Preliminary method development and evaluation of a statewide assessment of ground water and surface water interactions: *Ground Water Monitoring & Remediation*, vol. 17, no. 3, p. 64-69.

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Heidari, M., W.R. Roy, D.A. Keefer, A.J. Valocchi, L. Xu, and I.G. Krapac, 1997. Impact of Agricultural Chemical Use on Stream Water Quality Under Normal and Flood Conditions: Preliminary Results, *In* Research on Agricultural Chemicals in Illinois Groundwater: Status and Future Directions 7, Proceedings of the Seventh Annual Conference of the Illinois Groundwater Consortium. March 26, 1997, Makanda, Illinois, pp. 94-108.

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Locke, R.A., R.C. Berg, H.A. Wehrmann, M.V. Miller, and D.A. Keefer, 1997. Vulnerability of Illinois Nature Preserves to Potential Ground-Water Contamination. Volume 1: Methodology and Initial Assessment. Illinois State Water Survey Contract Report 612, 125p.

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Panno, S.V., Weibel, C.P., Krapac, I.G., and Stormont, E.C., 1997. Bacterial contamination of groundwater from private septic systems in Illinois' Sinkhole Plain: Regulatory considerations. Proceedings of the Sixth Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst, Springfield, MO, April 6-9, p. 443-447.

Panno, S.V., Wolf, E.M., and Carrillo, P.K., 1997. Karst land in Illinois: Hill, hollows, and honeycombed rock. Illinois State Geological Survey Educational Poster.

Risatti, J.B., E. Mehnert, and J.M. Madsen, 1997. Atrazine and nitrate in two alluvial aquifers in central Illinois, in Proceedings of the Seventh Annual Conference on Research on Agricultural Chemicals in Illinois Groundwater, Illinois Groundwater Consortium, pp. 80-93.

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Weibel, C.P. and Panno, S.V., 1997. Karst terrains and carbonate bedrock of Illinois. Illinois State Geological Survey, Illinois Map Series 8, 1:500,000 Scale.

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Heidari, M., D.A. Keefer, W.R. Roy, I.G. Krapac, A. Valocchi, and K. Ghiassi, 1998. Movement of Contaminants in Alluvial Aquifers During Light and Heavy (Flood) Rainfall Conditions: Field Data Collection and Model Simulation, *In* Research on Agricultural Chemicals in Illinois Groundwater: Proceedings of the Eighth Annual Conference of the Illinois Groundwater Consortium. April 1-2, 1998, Makanda, Illinois, 25p.

Krapac I.G., W.S. Dey, C.A. Smyth, and W.R. Roy, 1998, Impacts of bacteria, metals and nutrients on groundwater at two hog confinement facilities, in Proceedings of the National Ground Water Association Animal Feeding Operations and Groundwater: Issues, Impacts, and Solutions - A Conference for the Future, St. Louis, Mo., November 4-5, pp. 29-50

Panno, S.V., Hackley, K.C., and Nuzzo, V.A., 1998. Teaching of multidisciplinary environmental science in a wetland setting. *Journal of Geological Education*, v. 46, no. 2, p. 157-163.

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Panno, S.V., Krapac, I.G., and Keefer, D.A., 1998. A new device for collecting time-integrated water samples from springs and surface water bodies. *Environmental and Engineering Geosciences*, v. IV, no. 2, p. 375-383.

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APPENDIX 2. ISWS Publications List FY98 and FY99

Anliker, M.A., and D.M. Woller. 1998. Potential Ground-Water Resources for Springfield, Illinois. Illinois State Water Survey Contract Report 627, 197 p.

Burch, S.L., R.D. Olson, and A.P. Visocky. 1999. Ground-Water Investigation for the University of Illinois. ISWS Contract Report 636, 47 p.

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Frankie, W.T., J.A. Devera, R.J. Jacobson, C.A. Phillips, R.A Locke II, and M.J. Wagner. 1998. Guide to the Geology of the LaRue-Pine Hills Area, Jackson and Union Counties, Illinois. Illinois State Geological Survey Field Trip Guidebook 1998D/1999A. 77 p.

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Kelly, W.R., T.R. Holm, and H.A. Wehrmann. 1999. The Effects of Periodic Flooding on a Soil Contaminated with Heavy Metals, Preliminary Results. Abstract H42C-17, American Geophysical Union Annual Meeting, Boston, June 1-4, 1999, p. S141.

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- Locke R. A. II, January 1999, Potential for Groundwater Contamination at Illinois Nature Preserves and Class III Groundwater (abstract), In Proceedings of the Policy Forum on Regional Groundwater Protection Programs, Peoria, October 29, 1998, Illinois Environmental Protection Agency, IEPA/BOW/99-03, Springfield, Illinois, p. 18.
- Meyer, S.C. 1998. Ground-Water Studies for Environmental Planning, McHenry County, Illinois. Illinois State Water Survey Contract Report 630, 141 p.
- Panno, S.V., K.C. Hackley, W.R. Kelly, and H.H. Hwang. 1999. Sources of Nitrate Contamination in Karst Springs Using Isotopic Chemical and Bacterial Indicators: Preliminary Results. In Research on Agricultural Chemicals in Illinois Groundwater: Status and Future Directions IX, Proceedings of the Ninth Annual Conference, Carbondale, IL, April 1, 1999, pp. 91-103.
- Ray, C., T.W.D. Soong, G.S. Roadcap, and D. Borah. 1998. Agricultural chemicals: effects on wells during floods. *Journal American Water Works Association*, v. 90, no. 7, pp. 90-100.
- Ray, C., T.W. Soong, G. Roadcap, and D. Borah. 1998. A Study of the Dynamics of Contaminant Transport at Bank Filtration Sites. AWWA Proceedings, Dallas, TX. June 21, 1998.
- Roy, W.R., M. Heidari, I.G. Krapac, D.A. Keefer, S.F.J. Chou, and J.S. Lee. 1999. Pesticide Storage and Release in Soil: Results of a Field Experiment. In Research on Agricultural Chemicals in Illinois Groundwater: Status and Future Directions IX, Proceedings of the Ninth Annual Conference, Carbondale, IL, April 1, 1999, pp. 77-90.

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