4. CONCLUSIONS

Water is the lifeblood of Illinois: it nourishes and sustains life and economic development. Aquifers and river basins – the vessels that contain water – and aquatic and riparian ecosystems are integral and precious parts of our environment.

The history of water supply planning and management in Illinois demonstrates a hesitant and tortuous path towards the type of regional water supply planning and management discussed in this report – a path that many other states already embrace.

To protect public health, safety and welfare and stimulate economic development, it is essential to provide dependable and adequate supplies of clean water to meet demand at reasonable cost. In so doing, we must also protect the environment and our natural resources. These objectives can be achieved through improvements in water supply planning and management consistent with existing laws, regulations and property rights.

The regional water supply plan recommended by the Committee – a framework for action and action items – is based on a wealth of scientific and engineering data and information. That is not to say that there are no data gaps, that our understanding of water resources in the region is perfect, or to deny major uncertainties in future climate conditions and water demand. Combined, these limitations pose uncertainties and risks for water supply planning and management. The Committee has considered uncertainty and risk and has grappled with diverse social values.

The Committee has identified six foundations for improving water supply planning and management in East-Central Illinois – sustainable water supplies, adaptive management, sound science, self-governance, shared responsibilities, and an informed public.

Implementing planning and management standards will ensure sustainable water supplies, protect the environment, and minimize the risks of water shortages and conflict. Establishing a regional framework and process for water supply planning and management also will enhance the level of confidence for existing businesses to stay and new businesses to locate in East-Central Illinois. However, it must be recognized and accepted that complying with these standards may in some cases increase costs and lead to higher water prices for consumers; for example, increasing the distance between production wells to ensure that heads stay above the top of a confined aquifer, or locating regional well fields away from streams to minimize reductions in streamflow may increase infrastructure and operating costs.

Many of the building blocks of sound water supply planning and management already are in place. We don't need to demolish the existing structure; we need to strengthen the blocks, add a few new ones, and reinforce the cement between the blocks. Adding planning and management at the regional level is the cement that can improve communication and coordination among operators, stakeholders, scientists, the public and local and state agencies. The Committee recommends to today's stakeholders a regional water supply plan that will allow them to realize the potentials of the water resources in the region, shape their own future, and provide a worthy inheritance for future generations.

The Committee considers the alternatives to improving water supply planning and management to be undesirable. Such alternatives include the possibility of failing resources, threats of water shortages, crisis management, unscientific and wasteful approaches, stakeholder rivalries, degradation of the environment, threats to public welfare and economic development, and state government control. An alternative to an informed public is a fearful, poorly informed public and conflicted stakeholders who will see many reasons to blame water planners and providers for their problems. The Committee believes that these undesirable alternatives can be avoided or minimized by implementing the regional plan to maintain and increase the flow of the life blood of Illinois.

In a letter transmitting the 1967 state water plan to the people of Illinois[1], Governor Otto Kerner wrote, "… but the recommendations are of little value unless the words are translated into the reality of clean streams, water and open space for recreation, safe water supplies, and freedom from destructive floods. ….. For too long we have relied on piecemeal measures to solve our water problems."

The Foreword began with the assertive statement that "Illinois must plan the long-range development of its water resources, if the state is to meet the needs of the future." Forty two years later, that challenge remains.

A plan with no new laws or regulations and voluntary participation is perhaps more challenging to implement than having to comply with new laws or regulations. Self-governance requires stakeholders' participation and all to maintain open-minded, informed, just views of our personal, community and common welfare.

Reference

1. Illinois Technical Advisory Committee, 1967. *Water for Illinois: a Plan of Action.* Illinois Technical Advisory Committee on Water Resources, Springfield, IL.

GLOSSARY

Adaptive Management: A management approach where decisions made sequentially over time allow adjustments to be made as more information becomes available.

Aquifer: A saturated geologic formation that can yield economically useful amounts of groundwater to wells, springs, wetlands, or streams.

Aquifer (confined): soil or rock below the land surface that is saturated with water and can yield economically useful amounts of groundwater . There is a layer(s) of relatively impermeable material both above and below it and it is under pressure so that when the aquifer is penetrated by a well, the water will rise above the top of the aquifer.

Aquifer (unconfined): An aquifer whose upper water surface (water table) is at atmospheric pressure, and thus is able to rise and fall.

Artificial Wants: Use of water for other than natural wants. This included water for irrigation and propelling machinery.

Average Day Demand: The average quantity of water used each day over a one year period.

Base Flow: The sustained flow of a stream in the absence of direct runoff. It includes natural and human-induced streamflows. Natural base flow in a perennial stream is sustained largely by groundwater discharges.

Bedrock: The solid rock beneath the soil and surficial rock. A general term for solid rock that lies beneath soil, loose sediments, or other unconsolidated material.

Benefit: Something that has a good effect and promotes well being.

Climate: The statistical characterization of weather conditions in a region over a period of years.

Climate Variability: Variations in the statistical characterization of climate in a region over time.

Climate Change: A statistically significant change in climate over periods at least 30 years.

Commercial water use: Water used for motels, hotels, restaurants, office buildings, other commercial facilities, and institutions. Water for commercial uses comes both from public-supplied sources, such as a county water department, and self-supplied sources, such as local wells.

Community Water System: A public water system which serves at least 15 service connections used by year-round residents, or regularly serves at least 25 year-round residents. Any public water system serving seven or more homes, 10 or more mobile homes, 10 or more apartment units, or 10 or more condominium units is considered a community water system, unless information is available to indicate that 25 year-round residents will not be served.

Cone of Depression: A three-dimensional representation of the drawdown created around a pumping well. Taking the shape of an inverted cone, the drawdown is greatest at the pumping well and decreases logarithmically with distance from the pumping well to zero at the radius of influence.

Confining Unit: A layer of relatively impermeable geologic material which hampers the movement of water into and out of an aquifer. When an aquifer underlying a confining unit is penetrated by a well, the water level in the well will rise above the elevation of the top of the aquifer.

Confined Aquifer: An aquifer that has a potentiometric surface not exposed to the atmosphere.

Conjunctive Use: Application of surface water and groundwater to meet the demand for a beneficial use.

Conservation: The preservation, care and management of natural and cultural resources.

Consumptive Water Use: That part of water withdrawn that is evaporated, transpired by plants, incorporated into products or crops, consumed by humans or livestock, or otherwise removed from the immediate water environment and is not available for immediate or economical reuse. It is also referred to as water consumed.

Contaminant: A substance in water that adversely affects beneficial use.

Cost: The monetary or non-monetary expense or loss paid for providing something.

Desalination: The removal of salts from saline water to provide freshwater.

Dewatering an Aquifer: Removal of water from the upper portion of a confined aquifer. In most cases complete dewatering of an aquifer does not occur. However, complete dewatering can occur when a deeper, hydraulically connected aquifer is pumped to an extent that the upper aquifer is drained.

Discharge: The volume of water that passes a given location within a given period of time.

Domestic Water Use: Water used for household purposes, such as drinking, food preparation, bathing, washing clothes, dishes, vehicles, and dogs, flushing toilets, and watering lawns and gardens.

Drawdown: The difference between the pumping water level and non-pumping water level in a well. For an aquifer system, the difference between the natural condition water level and the water level as influenced by withdrawal of groundwater.

Drought: A long period of extremely dry weather. Drought is an example of climate variability.

Ecosystem: A group of interdependent organisms together with the environment they inhabit and depend on.

Efficiency: The degree to which something is done well without waste.

Evaporation: The process of liquid water becoming water vapor, including vaporization from water surfaces, land surfaces, and snow fields, but not from leaf surfaces.

Evapotranspiration: The sum of evaporation and transpiration.

Geomorphology: The study of the characteristics, origin, and development of landforms.

Goal: The state of affairs that a plan is intended to achieve in alignment with the vision.

Groundwater: Water in the saturated zone occupying saturated pore spaces and fissures. The upper surface of the saturated zone is called the water table.

Groundwater Mining: A process whereby groundwater is removed from an aquifer at a rate greater than it can be recharged, resulting in ever-lowering groundwater levels. Groundwater mining is synonymous with groundwater depletion.

Groundwater Recharge: The entry of water into the saturated zone of an aquifer. Infiltration of precipitation and its movement to the water table is one form of natural recharge. Also, the volume of water added by this process.

Groundwater Storage: The quantity of water in the zone of saturation.

Guidelines: A combination of laws, rules, concepts, principles and standards that reflect legal, moral and operational values and perspectives. Guidelines can include a vision of the future and goals.

Head; Hydraulic Head: The height above a standard datum of the surface of a column of water that can be supported by the static pressure at a given point. The level to which water will rise in a tightly encased well finished in a hydrogeologic unit. Groundwater flows from high head to low head.

Headwater: (1) the source and upper reaches of a stream; also the upper reaches of a reservoir. (2) the water upstream from a structure or point on a stream. (3) the small streams that come together to form a river. Also may be thought of as any and all parts of a river basin except the mainstream river and main tributaries.

Hydraulic Gradient: Difference in hydraulic head between two measuring points within a water system. In an aquifer, the rate of change of hydraulic head per unit of distance of flow at a given point and in a given direction.

Hydraulic Head: Hydraulic grade expressed as feet or pressure above the base of a well. Head can vary both vertically and spatially in a groundwater system. Groundwater flows from high to low heads, so it is the driving force in groundwater systems.

Hydrologic cycle: see Water Cycle.

Hydrology: Study of the physical behavior of water from its occurrence as precipitation to its entry into streams, lakes, reservoirs, and aquifers and its return to the ocean or atmosphere.

Impact: An effect requiring the specification of underlying conditions and assumptions. For example, the operation of a well for the purpose of withdrawing groundwater, by the laws of physics, must affect water pressure in the aquifer and water levels in wells finished in that aquifer; it can also affect water

pressure and water levels in connected aquifers and surface waters. The degree of impact is dependent upon a number of physical and hydraulic factors.

Impermeable: A layer of solid material, such as rock or clay, which does not allow water to pass through.

Induced Recharge: The process by which water enters the ground from a surface water source as a result of withdrawal of groundwater adjacent to the source. Wells, infiltration galleries, and collector wells located directly adjacent to and fed largely by surface water cause surface water to move into the groundwater system.

Industrial Water Use: Water used for industrial purposes in such industries as steel, chemical, paper, food processing, and petroleum refining.

Infiltration: The flow of water from the land surface into the subsurface.
Infrastructure: The underlying foundation or basic framework of a system.

Instream Water Use: Water that is used in, but not withdrawn from, surface waters for such purposes as hydroelectric-power generation, navigation, water-quality improvement, fish propagation, wildlife, habitat, and recreation. Sometimes called non-withdrawal use or in-channel use.

Interference: Drawdown caused by a nearby pumping well. Interference between pumping wells can affect well yield and is a factor in well spacing for well field design.

Irrigation: The controlled application of water for agricultural and other purposes through manmade systems to supply water requirements not satisfied by rainfall.

Municipal Water System: A community water system.

Leakage: Movement of water through a porous medium, often used in the context of water movement from a groundwater system to surface water, or vice versa. Leakage of water from a stream through an underlying porous medium, such as sand, can result in a loss of water from the stream and a gain in water in the groundwater system.

Minimum Instream Flow: The minimum flow a stream should contain for instream uses such as for critical ecological habitats and recreation. May refer either to specific instream water needs as determined by scientific studies or a protected flow level set by regulation.

Natural Wants: Quenching thirst, for household purposes, and for cattle and other domestic purposes.

Non-consumptive Water Use: Water use that incurs no consumptive loss.

Normal value: A climate value using 1971-2000 climate data.

Objective: A goal or end toward the attainment of which plans and policies are directed.

Peak Day Demand: The highest quantity of daily water usage in a municipal water system in a given year.

Per Capita Water Use: The average amount of water used per person during a standard time period, generally per day.

Percolation: 1) The movement of water through the openings in rock or soil. (2) The entrance of a portion of the streamflow into the channel materials to contribute to ground water replenishment.

Periglacial: Occurring or operating adjacent to the margin of a glacier.

Permeability: The ability of a material to allow the passage of a fluid, such as water through rocks. Permeable materials, such as gravel and sand, allow water to move quickly through them, whereas impermeable material, such as clay, does not allow water to flow freely.

Plan: A design which seeks to achieve agreed-upon objectives.

Program: A coordinated series of policies and actions to carry out a plan.

Potable Water: Water of a quality suitable for drinking.

Potentiometric Surface: A surface representing the total head of groundwater in a hydrogeologic unit defined by levels to which water will rise in tightly cased wells. A potentiometric surface can be defined for both confined and unconfined aquifers and sometimes is referred to as a water-level. A potentiometric surface or head map can be used to determine groundwater flow directions.

Precipitation: Rain, snow, hail, sleet, dew, and frost.

Principle: A fundamental opinion, understanding, or generally accepted tenet used to support objectives and prepare standards, plans and strategies.

Proglacial: Immediately in front of or just beyond the outer limits of a glacier or ice sheet.

Public Water System: A system providing piped water to the public for human consumption, if the system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. A public water system is either a “community water system” or a “noncommunity water system.” A public water system includes: (a) Any collection, treatment, storage, and distribution facilities under control of the operator of the public water system and used primarily in connection with the public water system, and (b) Any collection or pretreatment storage facilities not under control of the operator of the public water system which are used primarily in connection with the public water system.

Public Water Supply: Water withdrawn by public governments and agencies, such as a county water department, and by private companies that is then delivered to users. Most people's household water is delivered by a public water supplier.

Pumpage: The total volume of water pumped from a source or sources during a unit of time.

Recharge: Water added to the saturated zone, or the process of adding water to the recharge zone. Factors such as precipitation, temperature, land forms, land cover, soil moisture content and depth to water table influence the rate of groundwater recharge.

Recycled Water: Water that is used or can be used more than one time before it passes back into the natural hydrologic system.

Reservoir: A pond, lake, or basin, either natural or artificial, for the storage, regulation, and control of water.

Return Flow: (1) That part of a diverted flow that is not consumptively used and returned to its original source or another body of water. (2) (Irrigation) Drainage water from irrigated farmlands that re-enters the water system to be used further downstream.

Return Period: The time period with a specified percent chance of an event being equaled or exceeded in any given year.

Riparian: Along or near the bank of a river.

Risk: The danger that injury, loss or damage will occur.

River Basin: An area of land drained by a river and its tributaries.

Rule of Reasonable Use: Use of water to meet natural wants and a fair share for artificial wants.

Runoff: That part of the precipitation, snow melt, or irrigation water that appears in uncontrolled surface streams, rivers, drains or sewers. Runoff may be classified according to speed of appearance after rainfall or melting snow as direct runoff or base runoff, and according to source as surface runoff, storm interflow, or ground-water runoff. (2) The total discharge described in (1), above, during a specified period of time. (3) Also defined as the depth to which a drainage area would be covered if all of the runoff for a given period of time were uniformly distributed over it.

Saturated Zone: The zone in which all interconnected pore spaces are filled with water, usually underlying the unsaturated zone.

Scenario: A plausible specific set of assumptions used to estimate future water withdrawals or future climate change.

Seepage: Movement of water through a porous medium, often used in the context of water movement from a groundwater system to surface water, or vice versa.

Self-supplied Water: Water withdrawn from a surface or groundwater source by a user rather than being obtained from a public supply. An example would be home-owners obtaining water from their own well.

Soil Moisture: Water content in a soil, usually expressed as a percent (by weight or volume.

Standard: A criterion used as a basis of comparison to determine the adequacy of plan proposals to attain objectives.

Strategic Plan: The long-term vision and goals of an organization or program and an outline of how they will be achieved.

Strategy: An action to implement a plan.

Stream: A general term for a body of flowing water; natural water course containing water at least part of the year.

Streamflow: The water discharge that occurs in a natural channel. A more general term than runoff, streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

Subsidence: A dropping of the land surface as a result of groundwater being pumped. Cracks and fissures can appear in the land. Subsidence is virtually an irreversible process.

Surface Water: Water that is on the Earth's surface, such as in a stream, river, lake, reservoir or wetland. Surface water is naturally replenished by precipitation and naturally lost through evaporation to the atmosphere, discharge to the oceans, and sub-surface seepage.

Sustainability: Meeting the needs of the present generation without compromising the ability of future generations to meet their own needs.

Thermoelectric Power Plant Water Use: Water used in the process of the generation of thermoelectric power. Nuclear power plants and plants that burn coal and oil are examples of thermoelectric-power facilities.

Transpiration: The process by which water that is absorbed by plants, usually through the roots, is evaporated into the atmosphere from the plant surface, such as leaf pores.

Unaccounted-for Water: The difference between the volume of water pumped into the distribution system and the volume of water sold or otherwise accounted-for (generally expressed as a percentage of total pumpage).

Unconfined Aquifer: An aquifer that has a potentiometric surface exposed to the atmosphere.

Wastewater: Water that has been used in homes, industries, and businesses that is not for reuse unless it is treated.

Water Availability: The amount of water in rivers, streams, lakes, reservoirs, and aquifers at a given time that is available to be withdrawn.

Water Conservation: Practices that promote the efficient use of water, such as minimizing losses, reducing wasteful use, and protecting availability for future use.

Water Cycle: The circuit of water movement from the oceans to the atmosphere and to the Earth and return to the atmosphere through various stages or processes such as precipitation, interception, runoff, infiltration, percolation, storage, evaporation, and transportation.

Water Demand: (1) The amount of water required by a water user or users at a specific point or area

within a water supply system. (2) The amount of water required at a specific point or area within a water supply system to meet the requirements of a water user or users and allow for leakages and unaccounted-for water.

Water Distribution System: A group of water mains usually consisting of a network of piping, including transmission and distribution main which is designed to deliver water from water supplies to water users.

Water Resources: Sources of water that are useful, or potentially useful, to humans.

Water Storage: The amount of water in a reservoir, river, stream, lake, pond, aquifer or tank at a specified time.

Water Supply: The amount of water provided to meet water demand.

Water Supply Management: Actions, laws, regulations, strategies, policies etc. to develop the use of water and protect water resources.

Water Supply Planning: The process by which data are collected and processed to assess water demand and water-supply development alternatives.

Water Supply System: Facilities designed to collect, pump, and furnish a supply of water for meeting water demands.

Water Table: The elevation of fully saturated sediment or rock in a geological profile. The water table is the surface on which the fluid pressure in the pores of an aquifer is equal to atmospheric pressure.

Water Use: Water that is used for a specific purpose, such as for domestic use, irrigation, or industrial processing. Water use pertains to human's interaction with and influence on the hydrologic cycle, and includes elements, such as water withdrawal from surface and groundwater sources, water delivery to homes and businesses, consumptive use of water, water released from wastewater-treatment plants, water returned to the environment, and instream uses, such as using water to produce hydroelectric power.

Watershed: The land area that drains water to a particular stream, river, or lake. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge.

Well: An artificial excavation put down by any method for the purposes of withdrawing water from aquifers. A bored, drilled, or driven shaft, or a dug hole whose depth is greater than the largest surface dimension and whose purpose is to reach underground water supplies or oil, or to store or bury fluids below ground.

Wetland: An ecosystem whose soil is saturated for long periods seasonally or continuously, including marshes, swamps, and ephemeral ponds.

Withdrawal: Water removed from a ground- or surface-water source for use.

Yield: The amount of water that can be supplied from a reservoir, lake, stream, spring, or aquifer under explicitly stated conditions and assumptions.

Zone of Saturation: In a porous or fractured matrix, the interval where all interstices are filled with water. The surface of this zone is called the water table.

References

Encarta Dictionary: English (North America).

Illinois State Water Survey (http://isws.illinois.edu/wsp/faq/glossary.asp, accessed March 4, 2009).

Illinois State Geological Survey (http://www.isgs.uiuc.edu/glossary.shtml, accessed March 3, 2009).

Southeastern Wisconsin Regional Planning Commission, 2009. *A Regional Water Supply Plan for Southeastern Wisconsin*. Southeastern Wisconsin Regional Planning Commission Planning Report No.52 (http://www.sewrpc.org/watersupplystudy/chapters.asp, accessed March 5, 2009).

State of California, 2005. *California Water Plan Update 2005*. The Resources Agency, Department of Water Resources, Department of Water Resources Bulletin 160-05, Sacramento, CA.

United States Geological Survey (http://ga.water.usgs.gov/edu/dictionary.html, accessed March 6, 2009).

Wittman Hydro Planning Associates, Inc., 2008. *Water Demand Scenarios for the East-Central* Illinois *Planning Region: 2005-2050.* Wittman Hydro Planning Associates Inc., Bloomington, IN (http://www.mahometaquiferconsortium.org/, accessed March 7, 2008).

REFERENCES FOR ADDITIONAL BACKGROUND INFORMATION

This report discusses findings involving several scientific fields. Because it is necessarily short and concise, useful background information about many subjects of potential interest to readers have been omitted or only briefly considered. This is particularly true of geological and environmental information because the report purposefully concentrates on the hydrological aspects of water resources. Hopefully, such shortcomings as the reader may find will be addressed by the more self-explanatory and comprehensive regional studies recommended here and in the Appendices and their references.

Assessment of Illinois Water Quantity Law
Beck, Harrington, Hardy, and Feather, 1996. Final Report to Illinois Department of Natural Resources, Office of Water Resources, Springfield, IL.

Watershed Monitoring for the Lake Decatur, 2003-2006,
Keefer and Bauer, 2008. Illinois State Water Survey, CR 2008-04.

The Sediment Budget of the Illinois River
Demissie, Xia, Keefer and Bhowmik, 2004. Illinois State Water Survey, CR 2004-13.

Sedimentation Survey of Lake Decatur's Big and Sand Creek Basins, Macon County, Illinois
Bogner, 2002. Illinois State Water survey, CR 2002-09.

The Causes and Effects of Sedimentation in Lake Decatur
Brown, Stall and DeTurk, 1947. Illinois State Water Survey, B-37.

Potential Ground-water Resources for Springfield, Illinois
Anliker and Woller, 1998. Illinois State Water Survey, CR-627.

Drought Yields of Lake Springfield and Hunter Lake
Fitzpatrick and Knapp, 1991. Illinois State Water Survey, CR-515.

The Silting of Lake Springfield: Springfield, Illinois
Stall, Gottschalk and Smith, 1952. Illinois State Water Survey, RI-16.

Hydrologic Investigation of the Watershed of Lake Springfield, Springfield, Illinois
Fitzpatrick and Harbison, 1986. Illinois State Water Survey, CR-408.

Hydrology of Five Illinois Water Supply Reservoirs
Roberts 1948. Illinois State Water Survey, B-38.

Yield Assessment for Lake Vermilion, Vermilion County
McConkey and Knapp, 2001. Illinois State Water Survey, CR 2001-04.

Water Supply Alternatives for the City of Danville
Singh, 1978. Illinois State Water Survey, CR-196.

Hydrologic Design of Impounding Reservoirs in Illinois
Terstriep, Demissie, Noel, and Knapp, 1982. Illinois State Water Survey, B-67.

Groundwater Discharge to Illinois Streams
O'Hearn and Gibb, 1980, Illinois State Water Survey, CR-246.

Ground-Water Recharge and Runoff in Illinois
Walton, 1965, Illinois State Water Survey. RI-48.

Natural Recharge of Groundwater in Illinois
Hensel, 1992. Illinois State Geological Survey, Environmental Geology 143.

The Mahomet Aquifer: recent advances in our knowledge
Mehnert, Hackley. Larson, Panno, Pugin, Hehrmann, Holm, Roadcap, Wilson, and Warner, 2004. Illinois State Geological Survey, Open file series 2004-16.

Declining specific capacity of high-capacity wells in the Mahomet Aquifer: mineralogical and biological factors
Panno, Hackley, Mehnert, Larson, Canavan, and Young, 2005. Illinois State Geological Survey, Circular 566 (revised version of the original Circular 566).

Geology for Planning in the Springfield-Decatur Region, Illinois
Bergstrom, Piskin, and Follmer, 1976. Illinois State Geological Survey Circular 497.

Hydrostratigraphic Modeling of a Complex, Glacial-Drift Aquifer System for Importation into MODFLOW
Herzog, Larson, Abert, Wilson, and Roadcap, 2003. Ground Water, v. 41, no. 1, pp. 57-65.

Hydrogeology and Groundwater Availability in Southwest McLean and Southeast Tazewell Counties; Part 1, Aquifer Characterization
Herzog, Wilson, Larson, Smith, Larson, and Greenslate, 1995. Illinois State Geological Survey/Illinois State Water Survey Cooperative Groundwater Report 17.

Hydrogeology and Groundwater Availability in Southwest McLean and Southeast Tazewell Counties; Part 1, Aquifer Characterization (Appendices)
Herzog, Wilson, Larson, Smith, Larson, and Greenslate, 1995. Illinois State Geological Survey/Illinois State Water Survey Cooperative Groundwater Report 17A.

Mahomet Bedrock Valley in East-Central Illinois; Topography, Glacial Drift Stratigraphy, and Hydrogeology: in Geology and Hydrogeology of the Teays-Mahomet Bedrock Valley System
Kempton, Johnson, Heigold, and Cartwright, 1991. Melhorn and Kempton editors, Geological Society of America Special Paper 258.

Hydrogeologic Evaluation of Sand and Gravel Aquifers for Municipal Groundwater Supplies in East-Central Illinois
Kempton, Morse, and Visocky, 1982. Illinois State Geological Survey/Illinois State Water Survey Cooperative Groundwater Report 8.

Ground-Water Resources of Northern Vermilion County, Illinois

Kempton, Ringler, Heigold, Cartwright, and Poole, 1981. Illinois State Geological Survey Environmental Geology Notes 101.

Regional Groundwater Resources in Western McLean And Eastern Tazewell Counties with Emphasis on the Mahomet Bedrock Valley
Kempton and Visocky, 1992. Illinois State Geological Survey/Illinois State Water Survey Cooperative Groundwater Report 13.

Illinois Groundwater; A Vital Geologic Resource
Killey and Larson, 2004. Illinois State Geological Survey Geoscience Education Series 17.

Three-Dimensional Geologic Maps of Quaternary Sediments in East-Central Illinois
Soller, Price, Kempton, and Berg, 1999. USGS Geologic Investigations Series Map I–2669 (3 sheets).

The Mahomet Aquifer: a transboundary resource in east-central Illinois
Larson, Mehnert, and Herzog, 2003. Illinois State Geological Survey, Reprint 2003-E from: International Water Resources Association. Water International, volume 28, Number 2, Pages 199-207, June 2003.

Groundwater geology of DeWitt, Piatt, and northern Macon Counties, Illinois
Larson, Herzog, and Larson, 2003. Illinois State Geological Survey, Environmental Geology 155.

The Sankoty-Mahomet aquifer in the confluence area of the Mackinaw and Mahomet Bedrock Valleys, central Illinois: a reassessment of aquifer characteristics
Wilson, Kempton, Lott, 1994. Illinois State Geological Survey, Cooperative Groundwater Report 16.

Ground Water and Surface Water: A Single Resource
Winter, Harvey, Frank and Alley, 1998. U.S. Geological Survey, Circular 1139.

7-day 10-year Low Flows of Streams in the Kankakee, Sangamon, Embarras, Little Wabash, and Southern Regions Singh, Ganapathi and Il Won, 1988. Illinois State Water Survey, CR-441.

Landforms of Illinois
Bier, 1980. Illinois State Geological Survey map, Champaign, IL.

Illinois Ice Age Legacy
Killey, 2007. Illinois State Geological Survey Geoscience Education Series 14,
Champaign, IL.

Groundwater Geology of DeWitt, Piatt, and Northern Macon Counties
Larson, *et al*., 2003. Illinois. Illinois State Geological Survey Environmental Geology Note 155,
Champaign, IL.

The Heart of the Sangamon: An Inventory of the Region Resources
Illinois Department of Natural Resources, 2000. Critical Trends Assessment Program, Illinois Department of Natural Resources, Springfield, IL
[Order from the IDNR Clearinghouse: https://dnr.state.il.us/teachkids/].

The Lower Sangamon River Valley: An Inventory of the Region's Resources.

[Order from the IDNR Clearinghouse: https://dnr.state.il.us/teachkids/].

The Mackinaw River Basin: An Inventory of the Region s Resources
Post, 1997. Illinois Department of Natural Resources, Critical Trends Assessment Program, Illinois Department of Natural Resources, Springfield, IL.

Water Supply Planning: http: //www.isws.illinois.edu/wsp/

Climate: http://isws.illinois.edu/atmos/statecli/index.htm

Streamflow and Shallow Groundwater Data: http://isws.illinois.edu/warm/

Glacial Geology: http://www.isgs.illinois.edu/research/glacial-geo.shtml

Bedrock Geology: http://www.isgs.illinois.edu/sections/indust-min/bedrock-geology.shtml

Hydrogeology: http://www.isgs.illinois.edu/research/hydrogeology.shtml

Arsenic in Illinois Groundwater: http://isws.illinois.edu/gws/arsenic/

Critical Trends Assessment Project
http://www.refworks.com/refshare/?site=023461151737200000/RWWS4A1148667/CTAP%20Reports