

# Enhancing Groundwater Recharge for Water Supply

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# Acknowledgments

- Illinois State Geological Survey
- George Roadcap, Illinois State Water Survey
- Southeastern Wisconsin Regional Planning Commission (SEWRPC)



# Key Concepts

- Infiltration
- Groundwater Recharge
  - Groundwater Recharge
  - Aquifer Recharge
- Groundwater Discharge
- Recharge Zones
- Discharge Zones
- Local and Regional Flow Systems

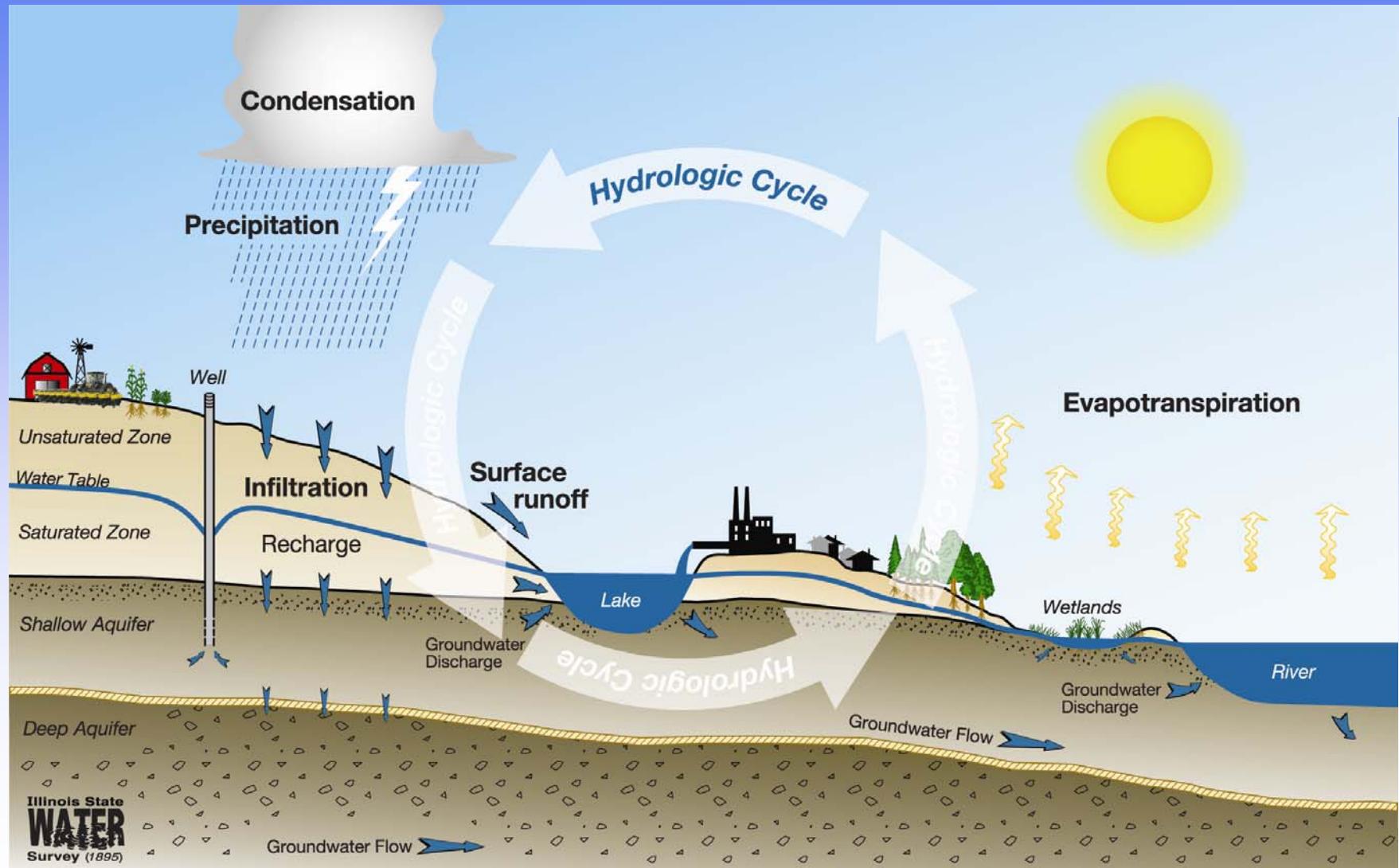
# Definitions

- *Infiltration* – entry and associated downward flow of water from the ground surface into the unsaturated zone
- *Recharge* – advance of water into the saturated zone, associated with flow away from the water table and within the saturated zone
- *Recharge to an aquifer* – when water enters a hydrostratigraphic unit defined as an aquifer as opposed to simply passing the water table

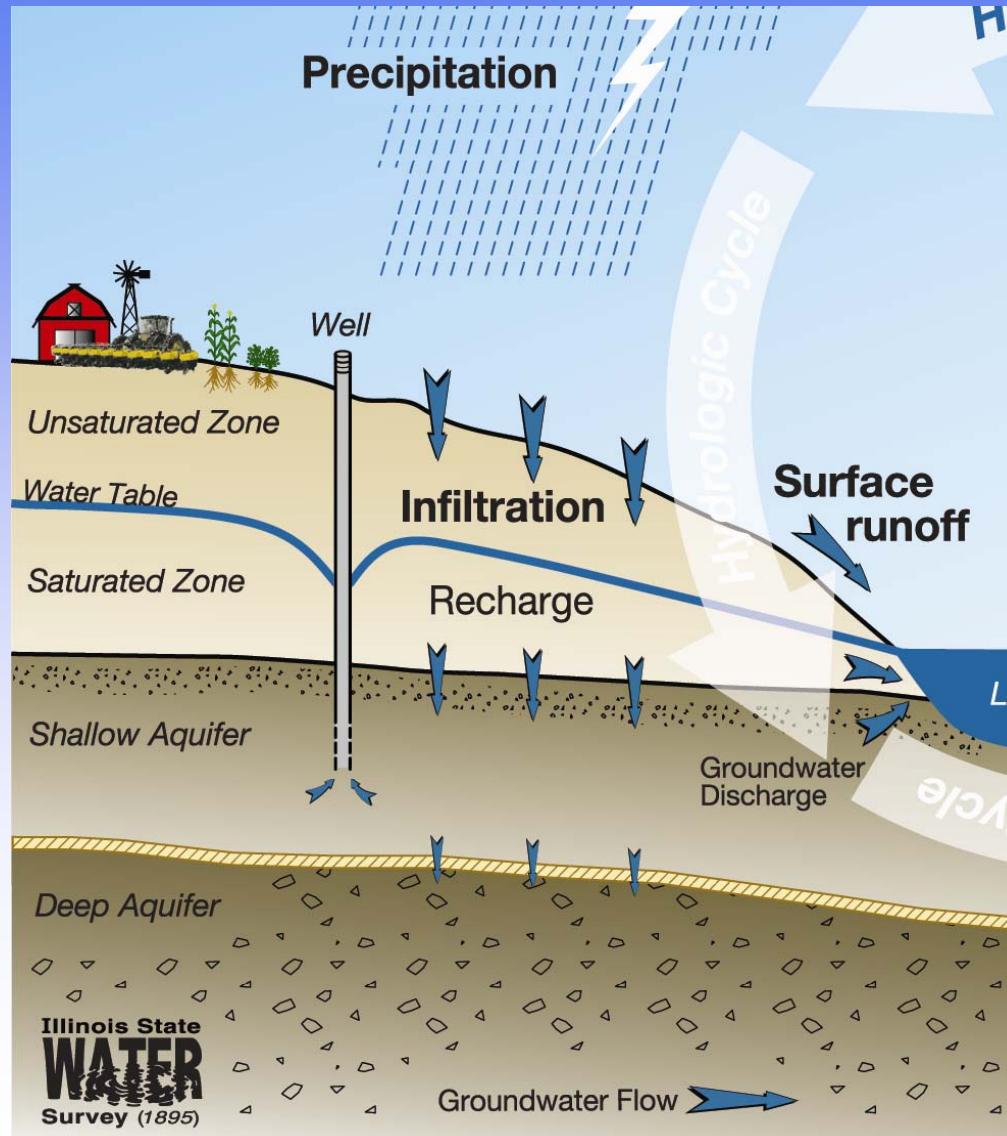
*Groundwater*, R.A. Freeze and J.A. Cherry, 1979. Prentice-Hall, Englewood Cliffs, NJ.

*Natural Recharge of Groundwater in Illinois*, Bruce Hensel, 1992. Illinois State Geological Survey, EG142.

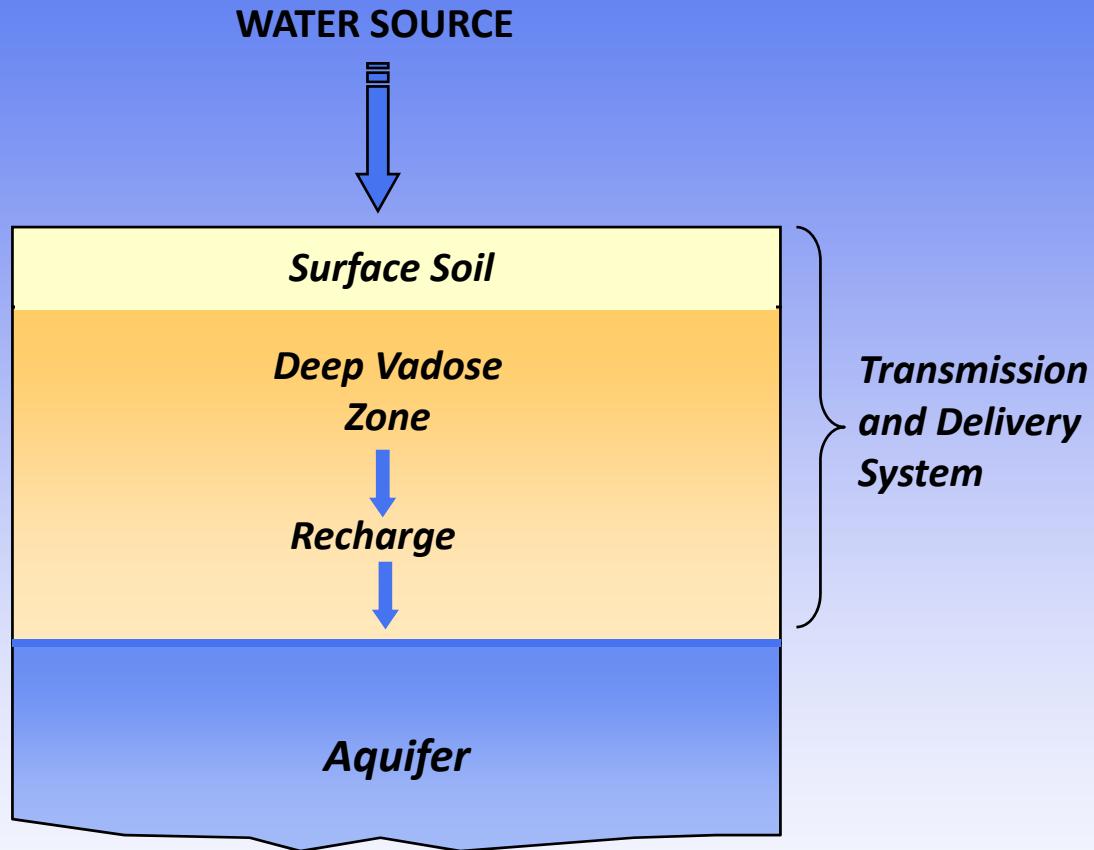
# The Hydrologic Cycle



# Groundwater Recharge



# Three Basic Elements of a Recharge System



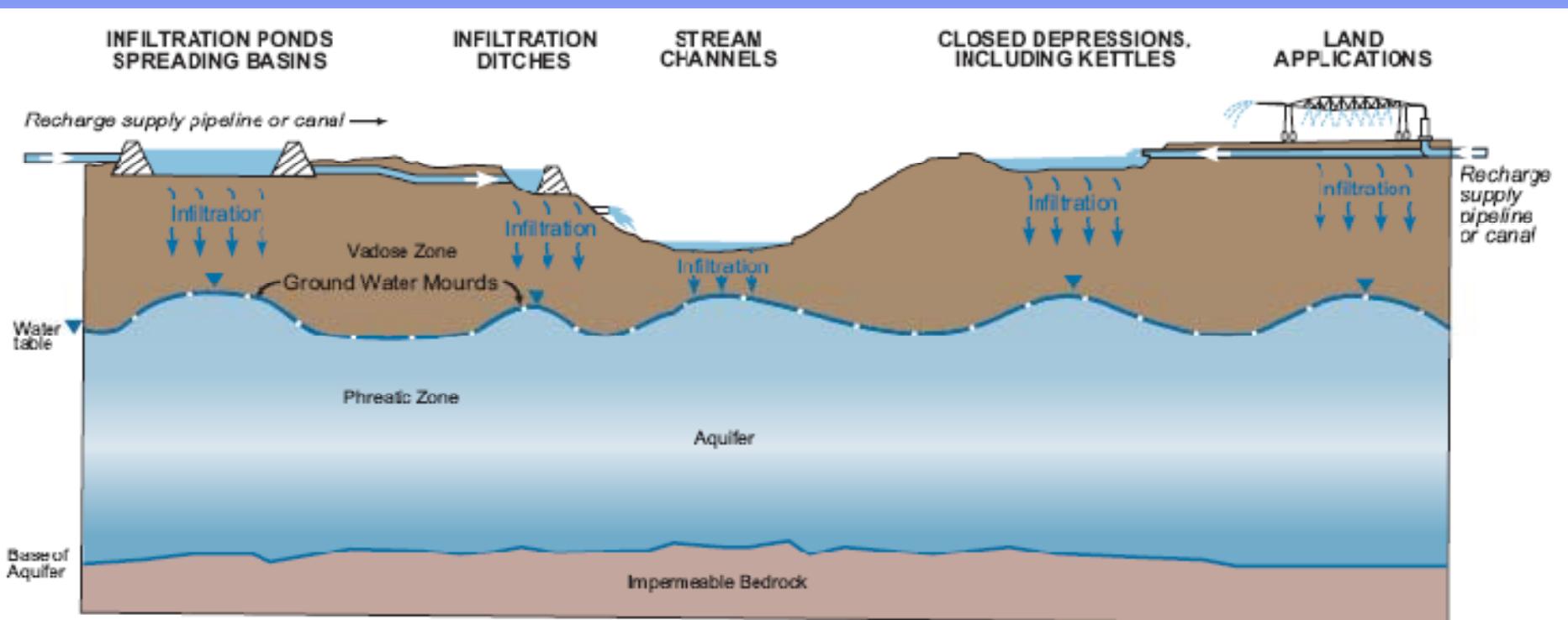
Source: Daniel Stevens, Presentation to the Groundwater Resource Association of California, San Joes and SEWRPC. See also:  
SEWRPC Technical Report No. 43, <http://www.sewrpc.org/watersupplystudy/documents.shtm>

# Factors Affecting Infiltration and Recharge

- Rainfall intensity and duration
- Texture and permeability of soil/geologic materials
- Soil moisture/depth to water table
- Slope and landscape position
- Land cover
  - Vegetation (row crop, grasses, trees, etc.)
  - Impervious surface (building footprint, streets, driveways, sidewalks, parking lots, etc.)
  - Retention/detention basins
- Presence and type of water sources or sinks (e.g., leaky water supply pipes, storm sewers)

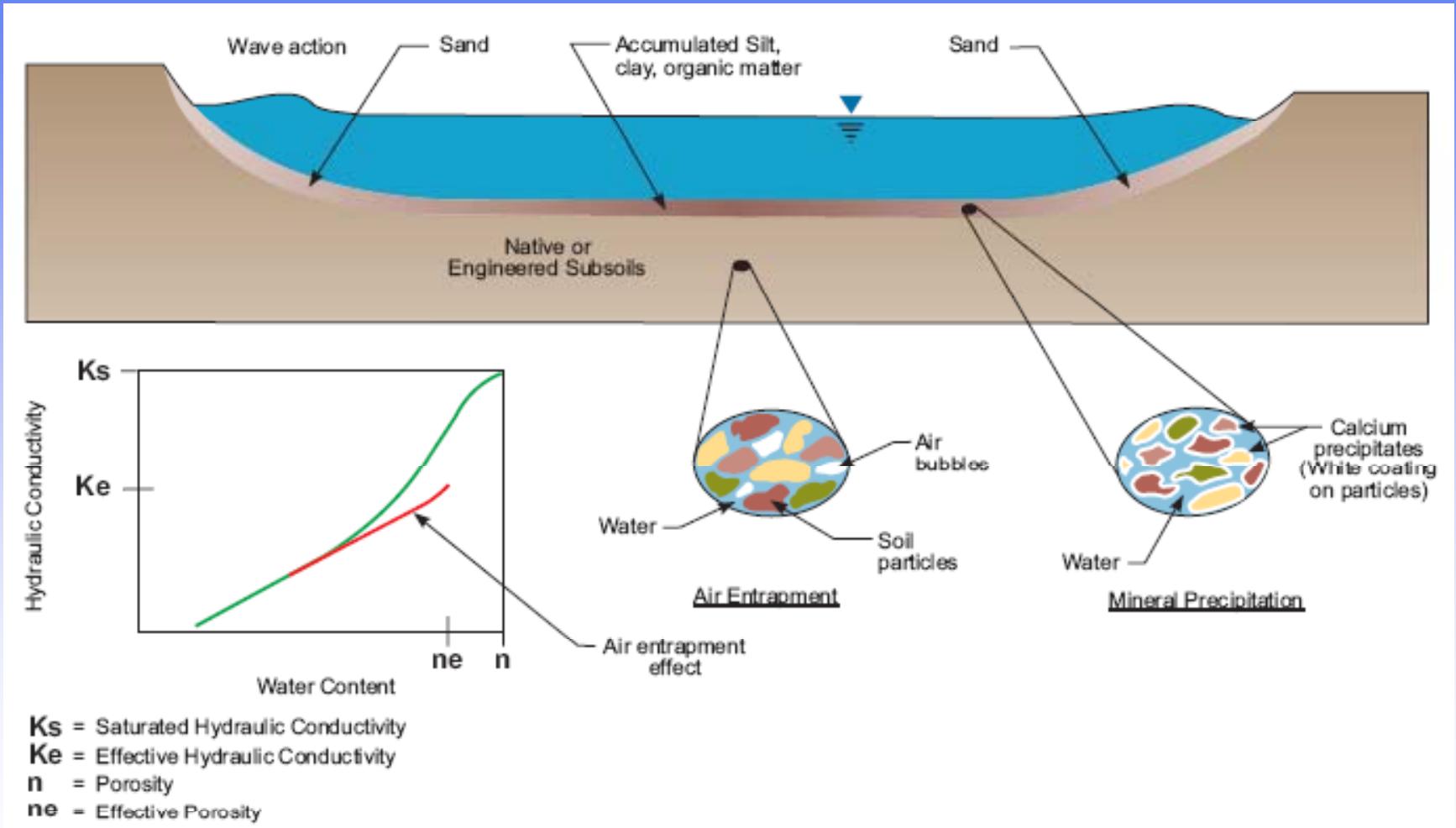
*Natural Recharge of Groundwater in Illinois*, Bruce Hensel, 1992. Illinois State Geological Survey, EG142.

# Examples of Surface Infiltration Technologies



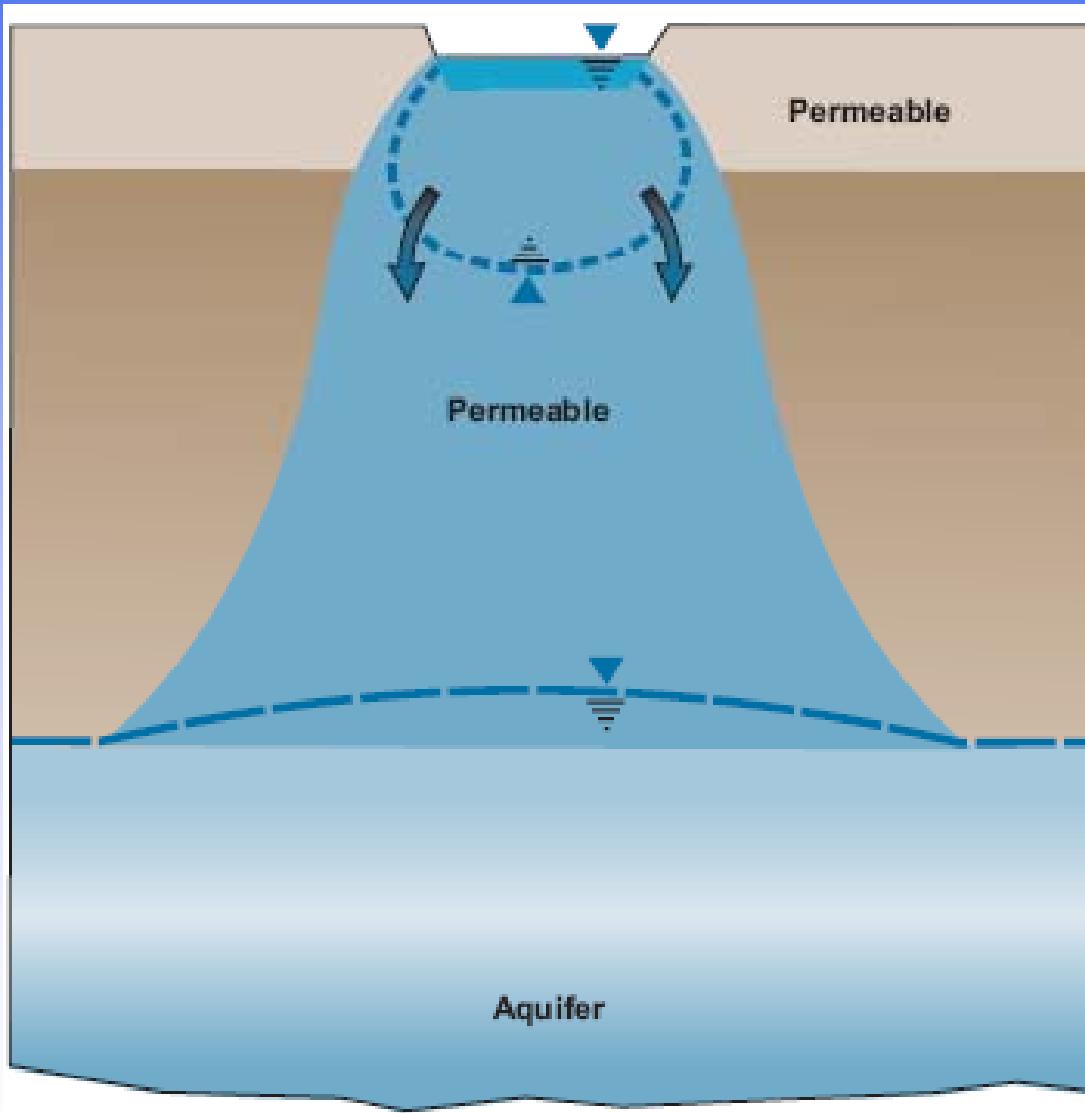
Source: Colorado Geological Survey, Department of Natural Resources and SEWRPC. See also:  
SEWRPC Technical Report No. 43, <http://www.sewrpc.org/watersupplystudy/documents.shtm>

# Common Clogging Problems of a Recharge Basin

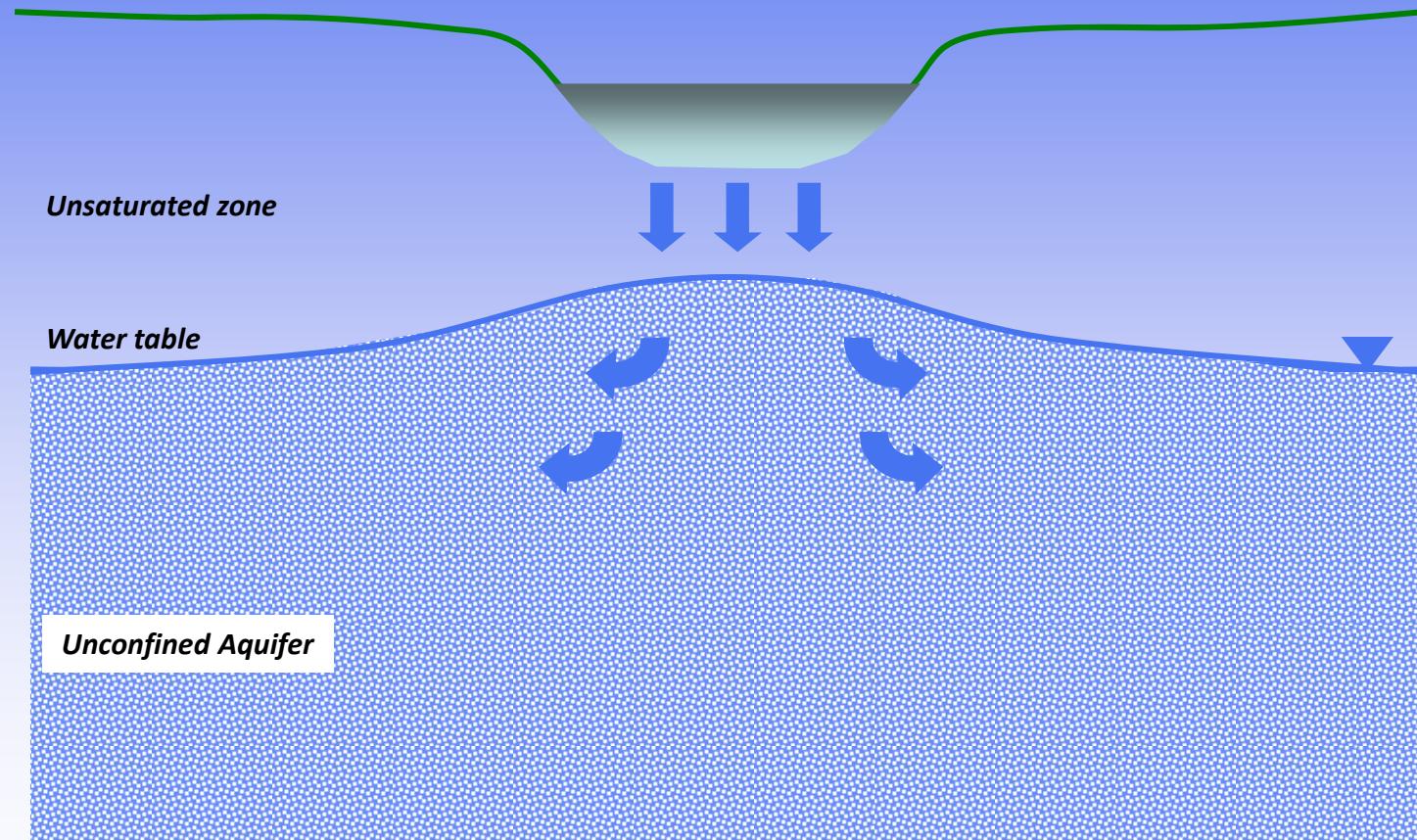


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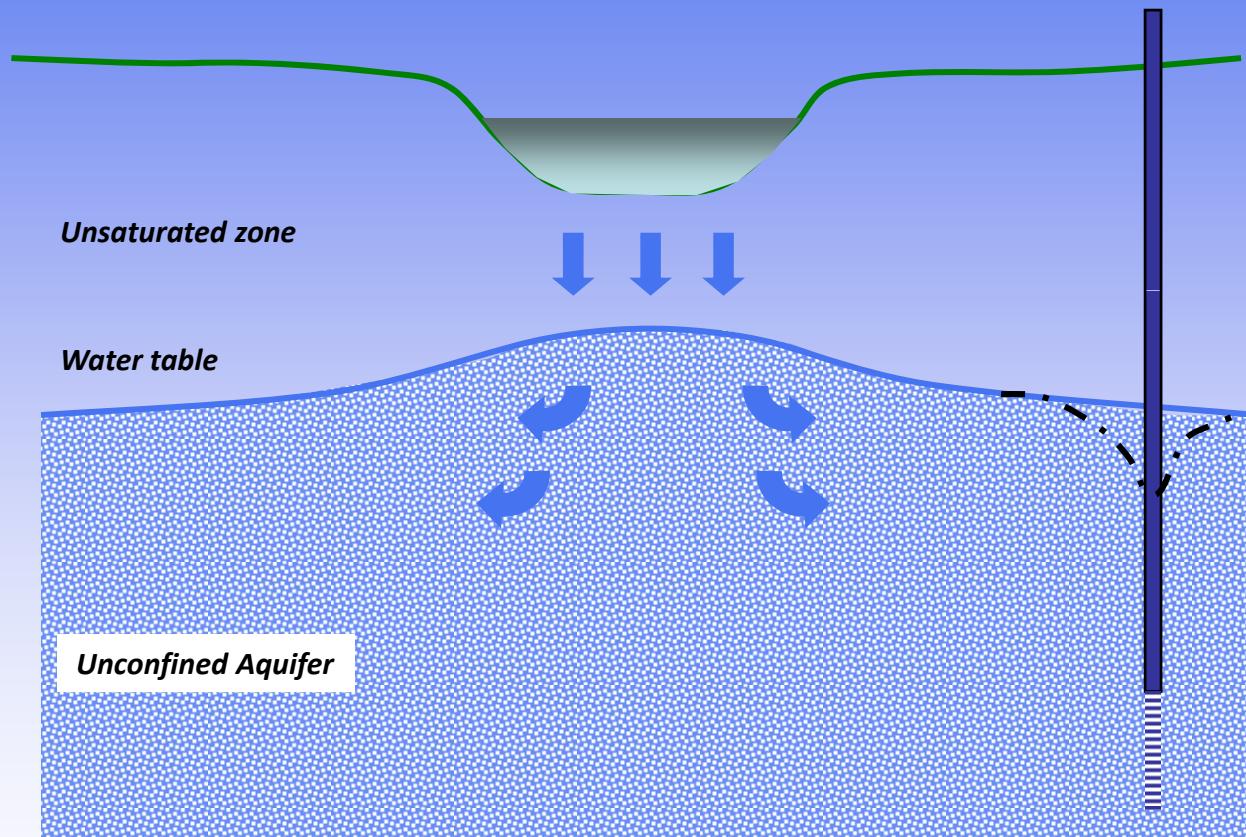
## Surface Recharge System with Permeable Vadose Zone



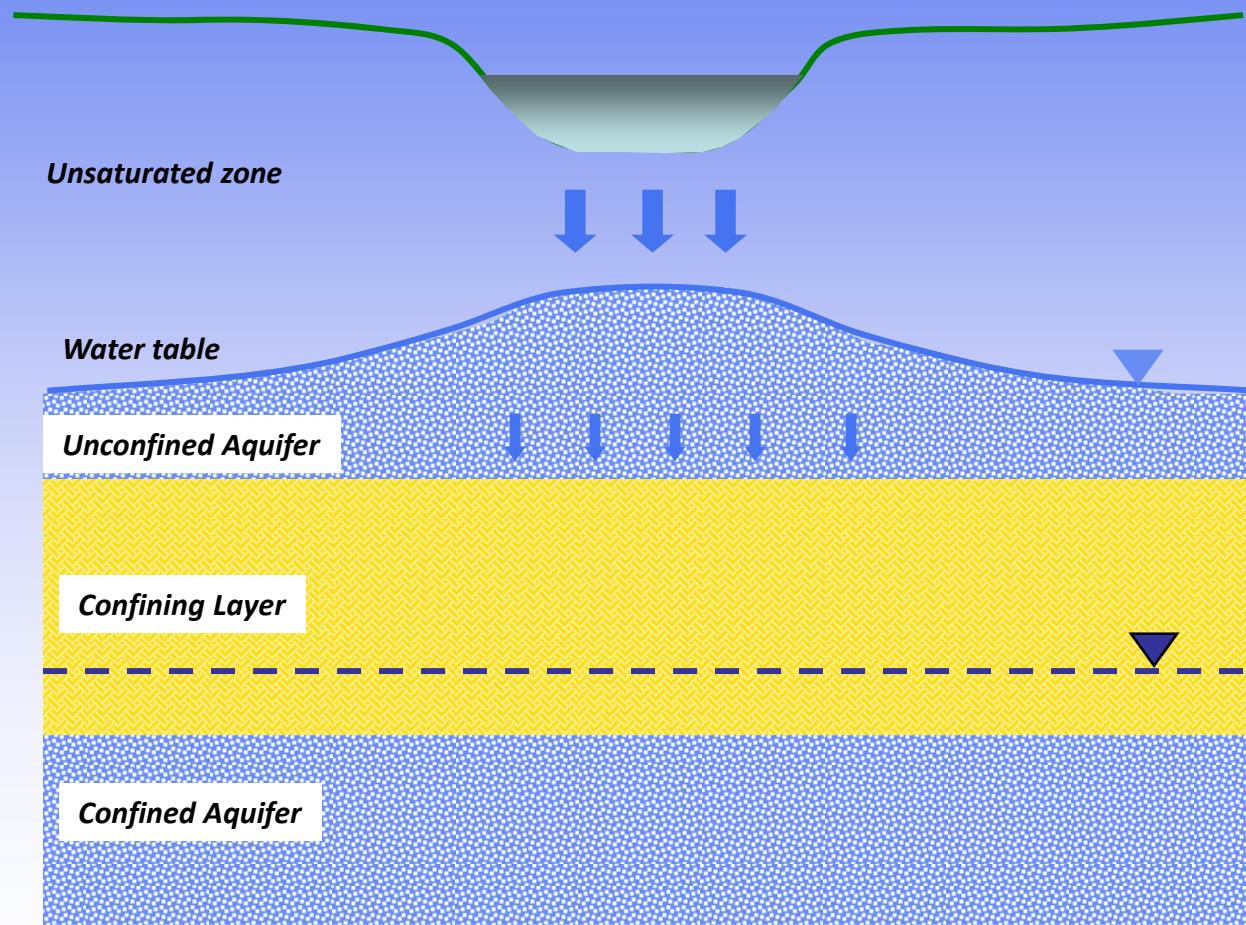
Source: Daniel Stevens, Presentation to the Groundwater Resource Association of California, San Joes and SEWRPC. See also:  
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# Increase aquifer saturated thickness/ Reduce impacts of drawdown



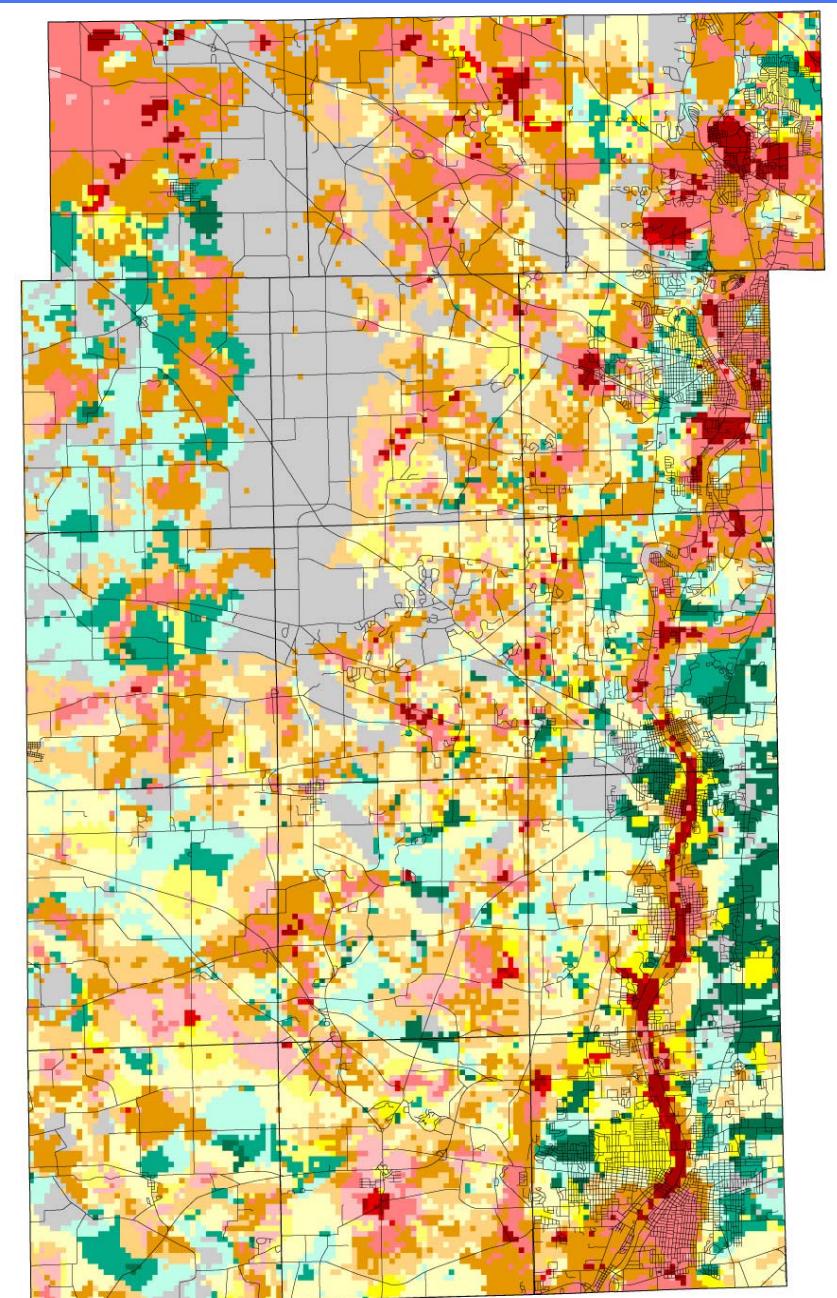
# Effect on confined aquifers?



# Geologic Mapping Approach to Potential for Recharge

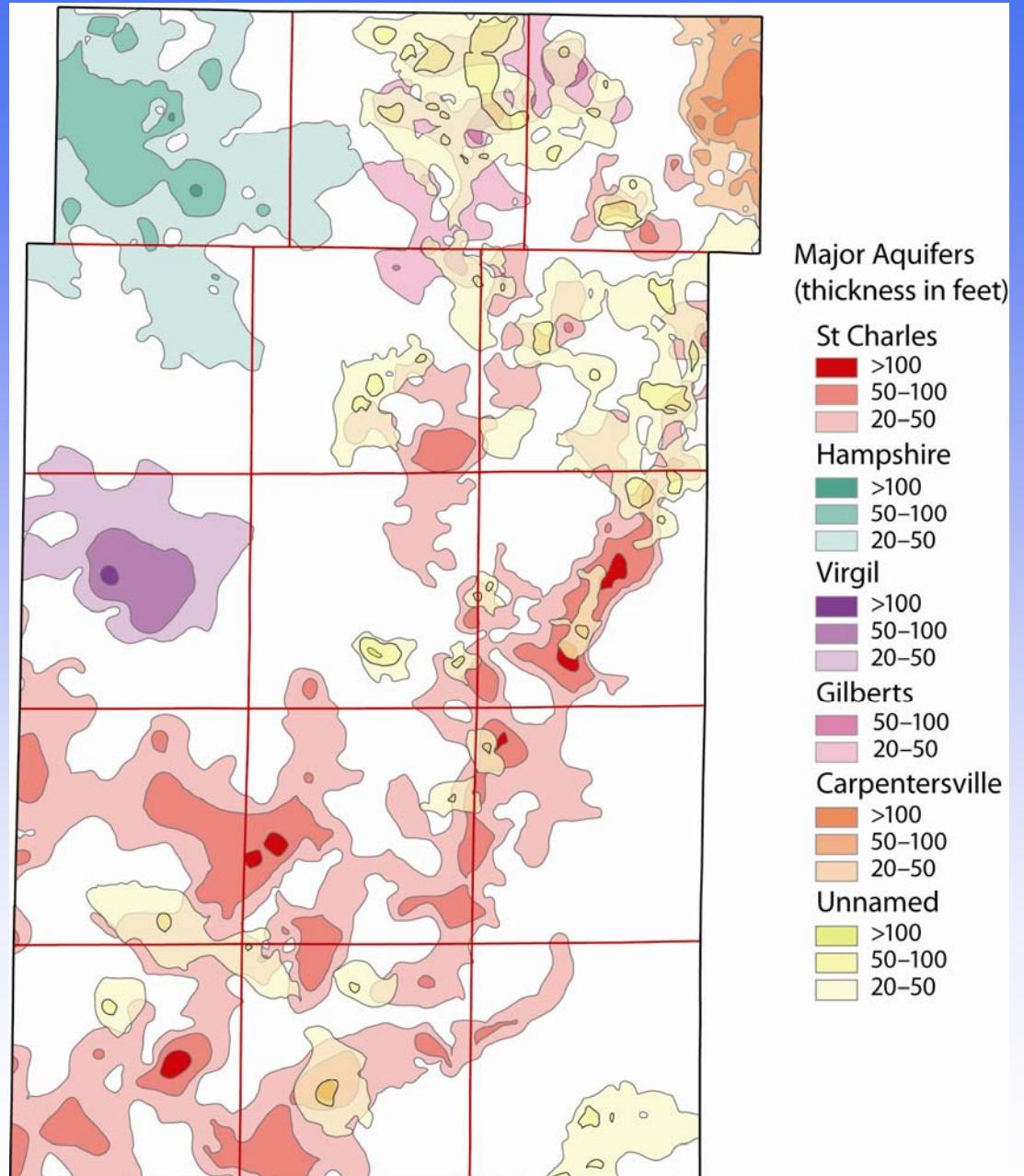
- Originally developed to predict likelihood of uppermost aquifers to contamination from surface or near-surface sources
- Surrogate for estimate of aquifer recharge potential
- Screening tool for prioritizing resources and guiding planning (e.g., IEPA, Winnebago County Health Dept., McHenry County)

# Aquifer Sensitivity Map for Kane County



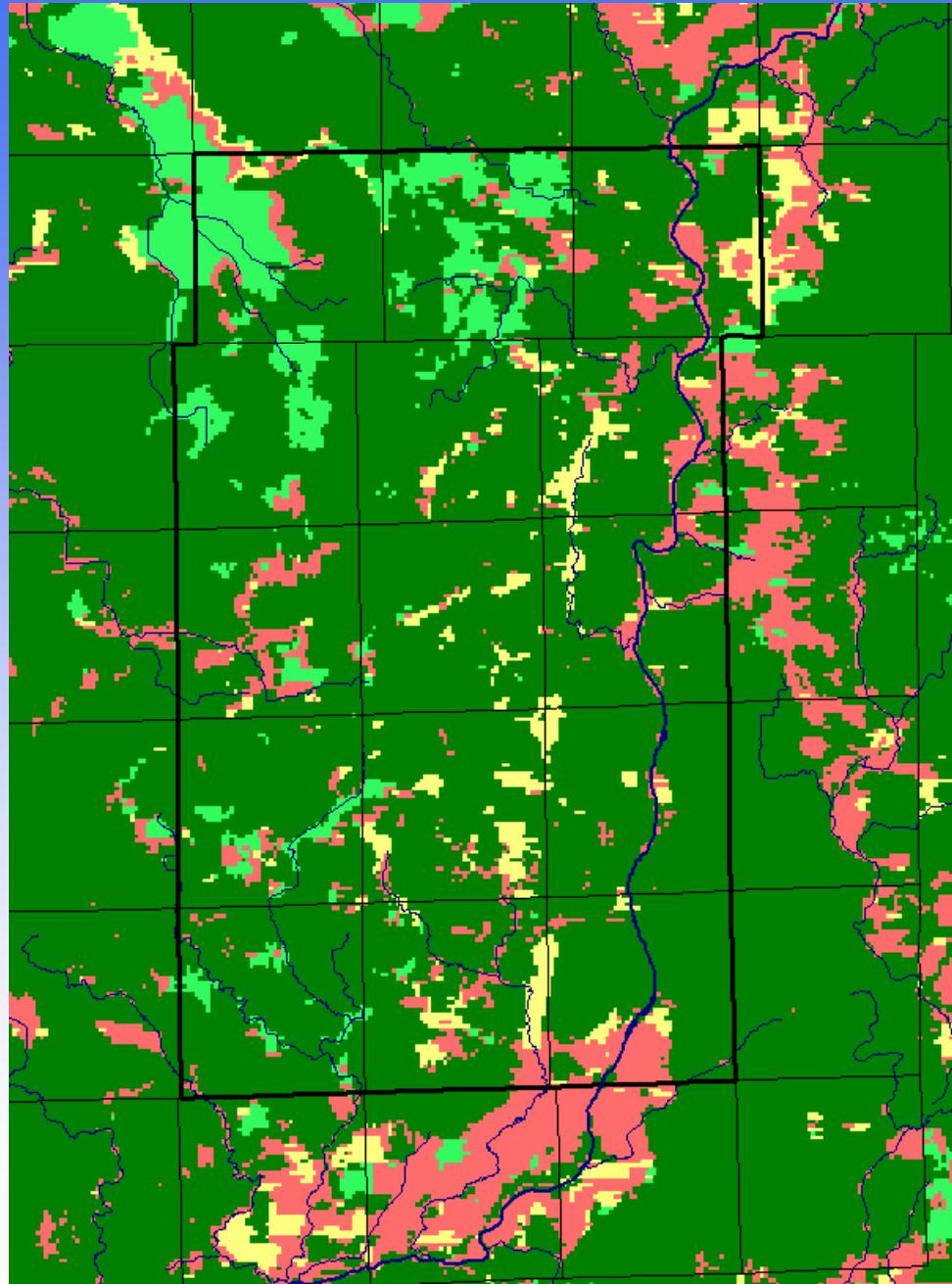
*Source: Illinois State Geological Survey*

# Major Quaternary Aquifers in Kane County

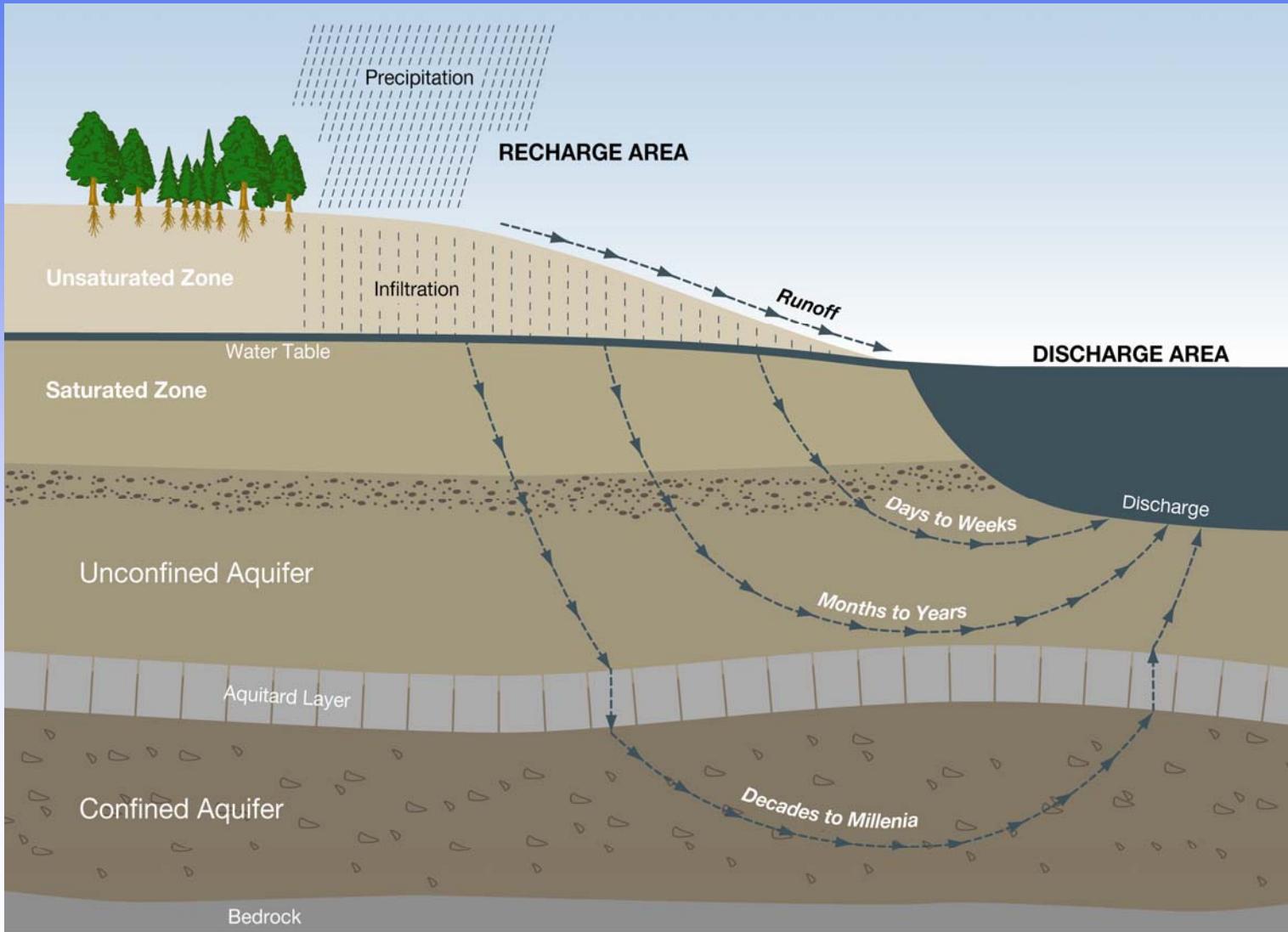


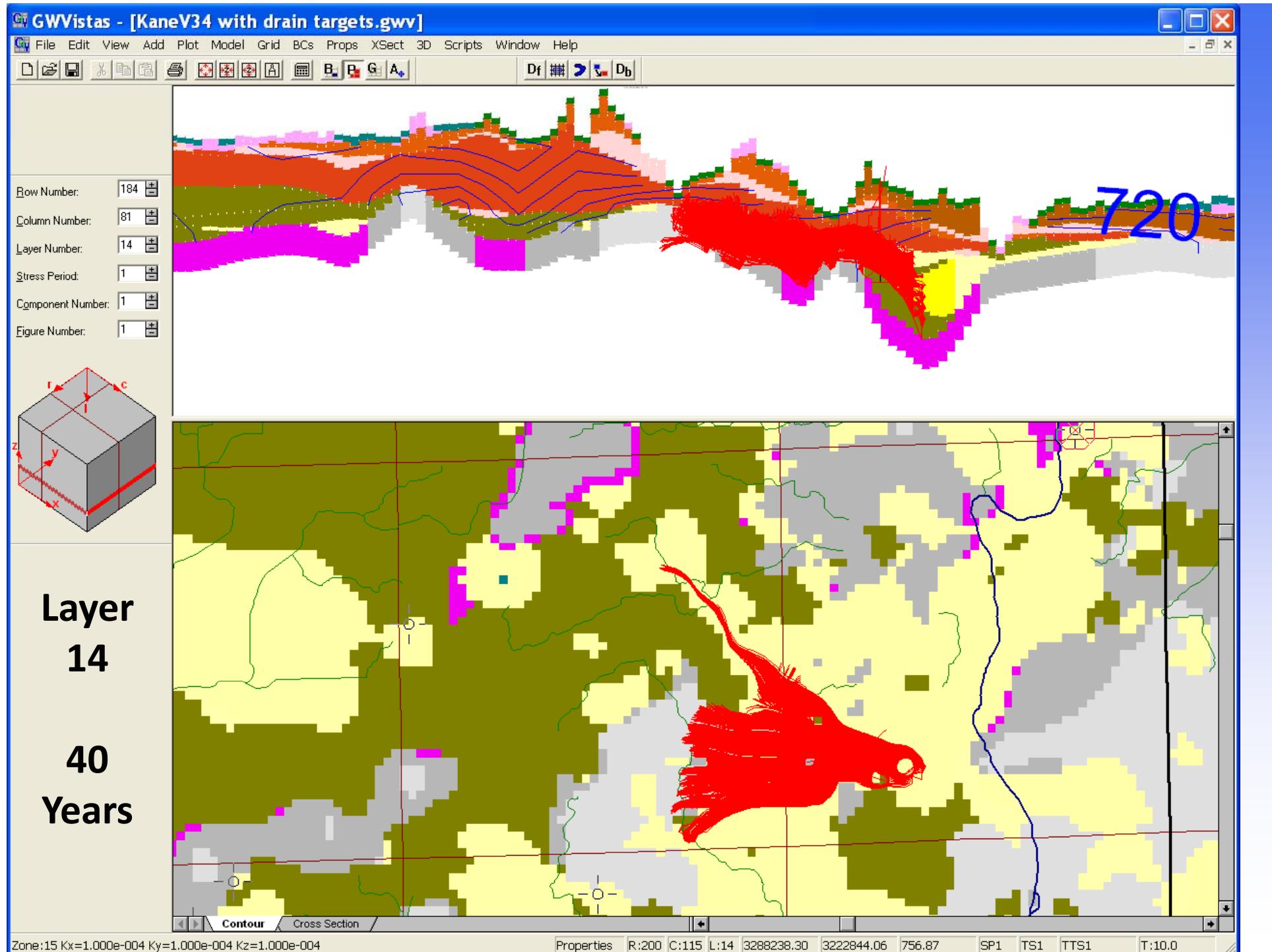
Source: Illinois State Geological Survey

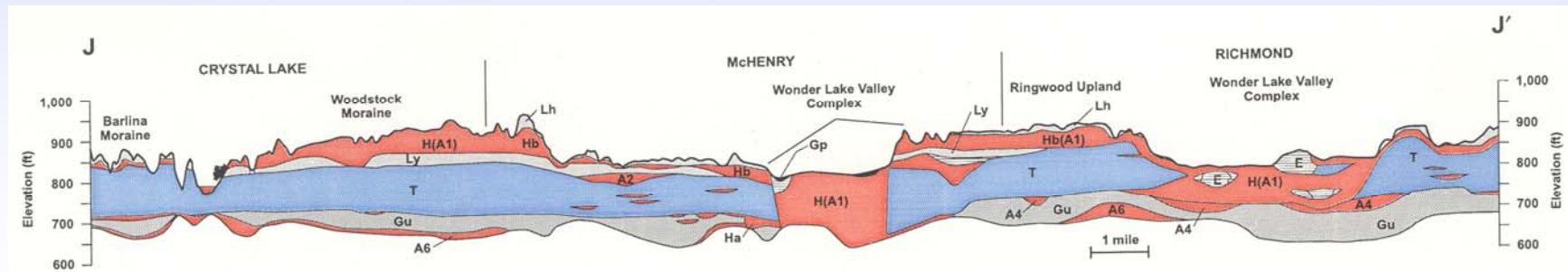
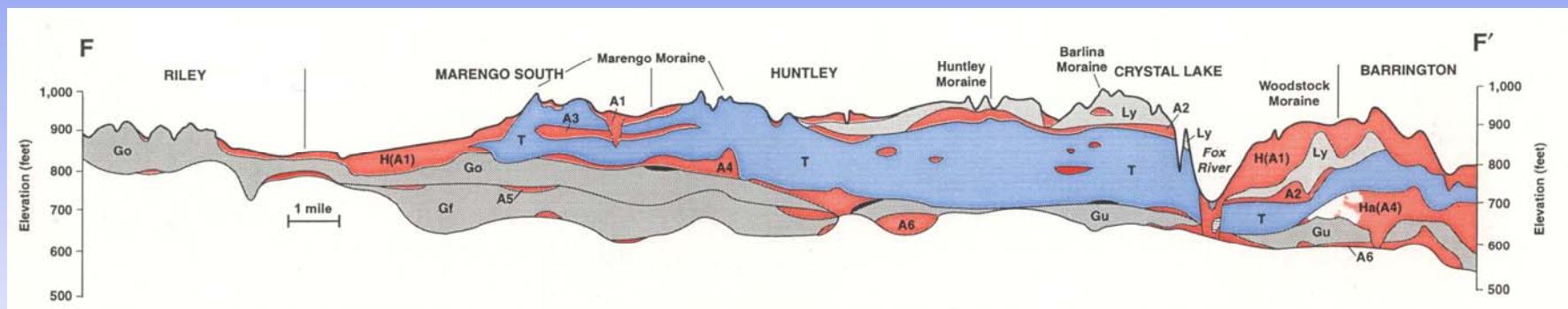
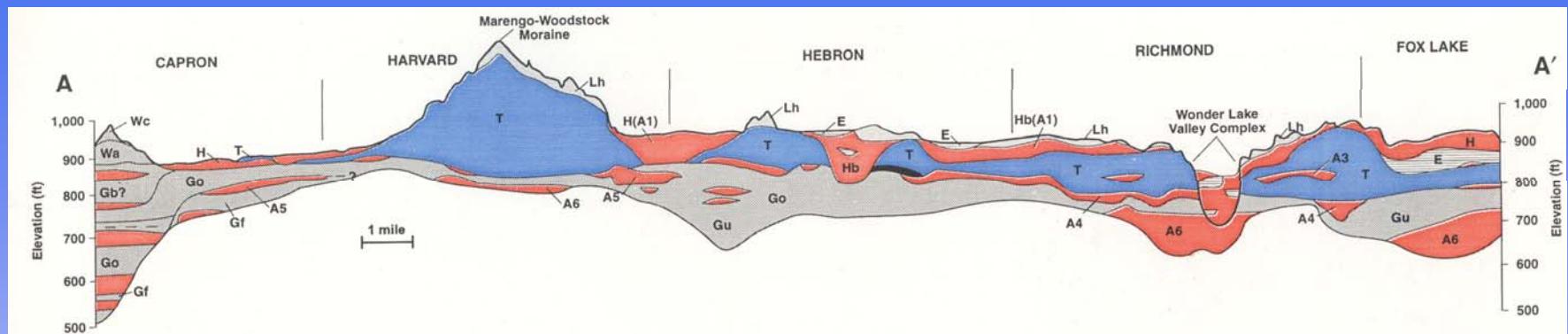
# Kane County Model Groundwater Recharge Zonation



# Local/Regional Groundwater Flow Systems

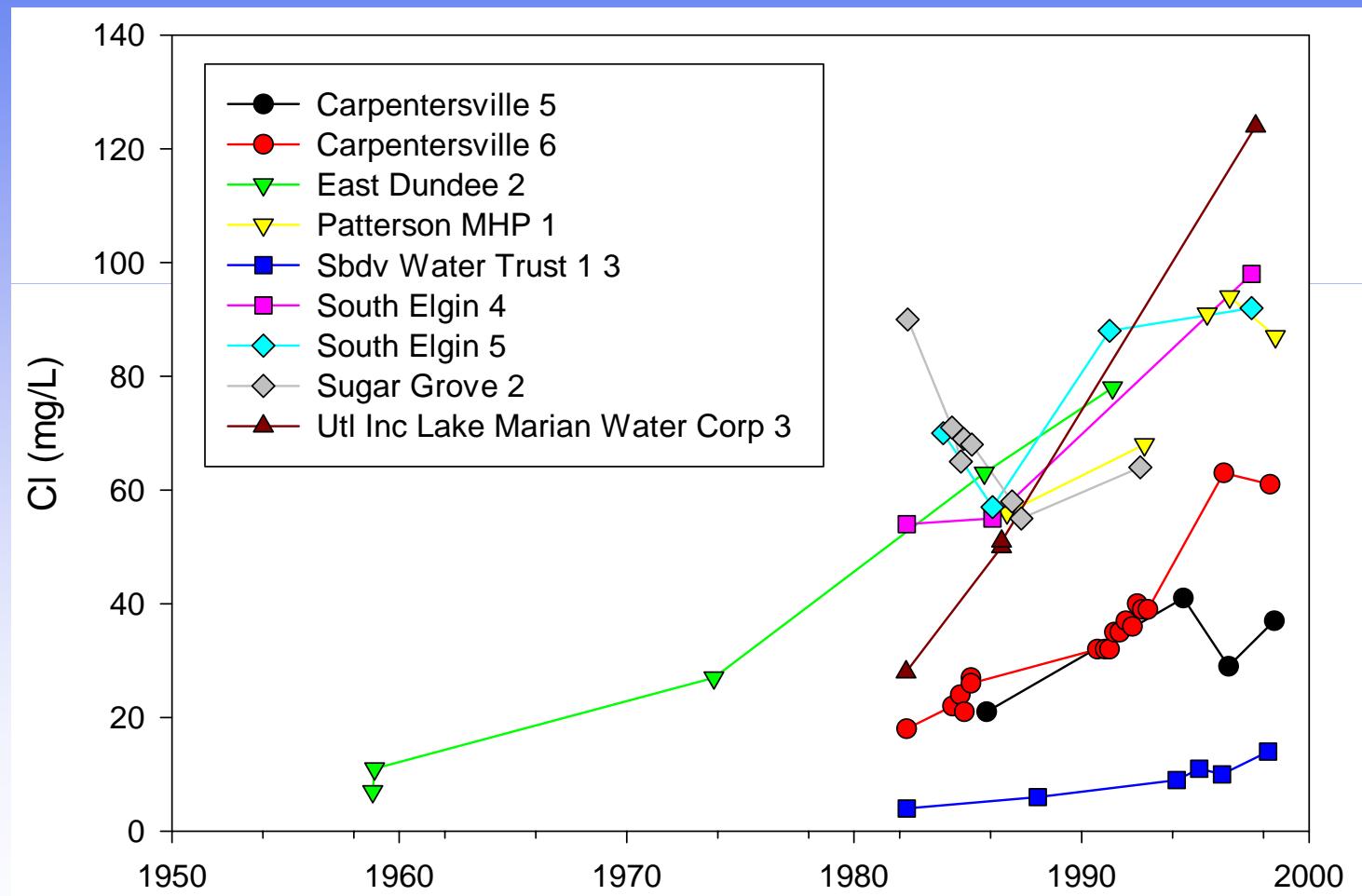






Source: Illinois State Geological Survey

# Water Quality Changes in Shallow Kane County Public Water System Wells



# SEWRPC Enhanced Recharge Proposal

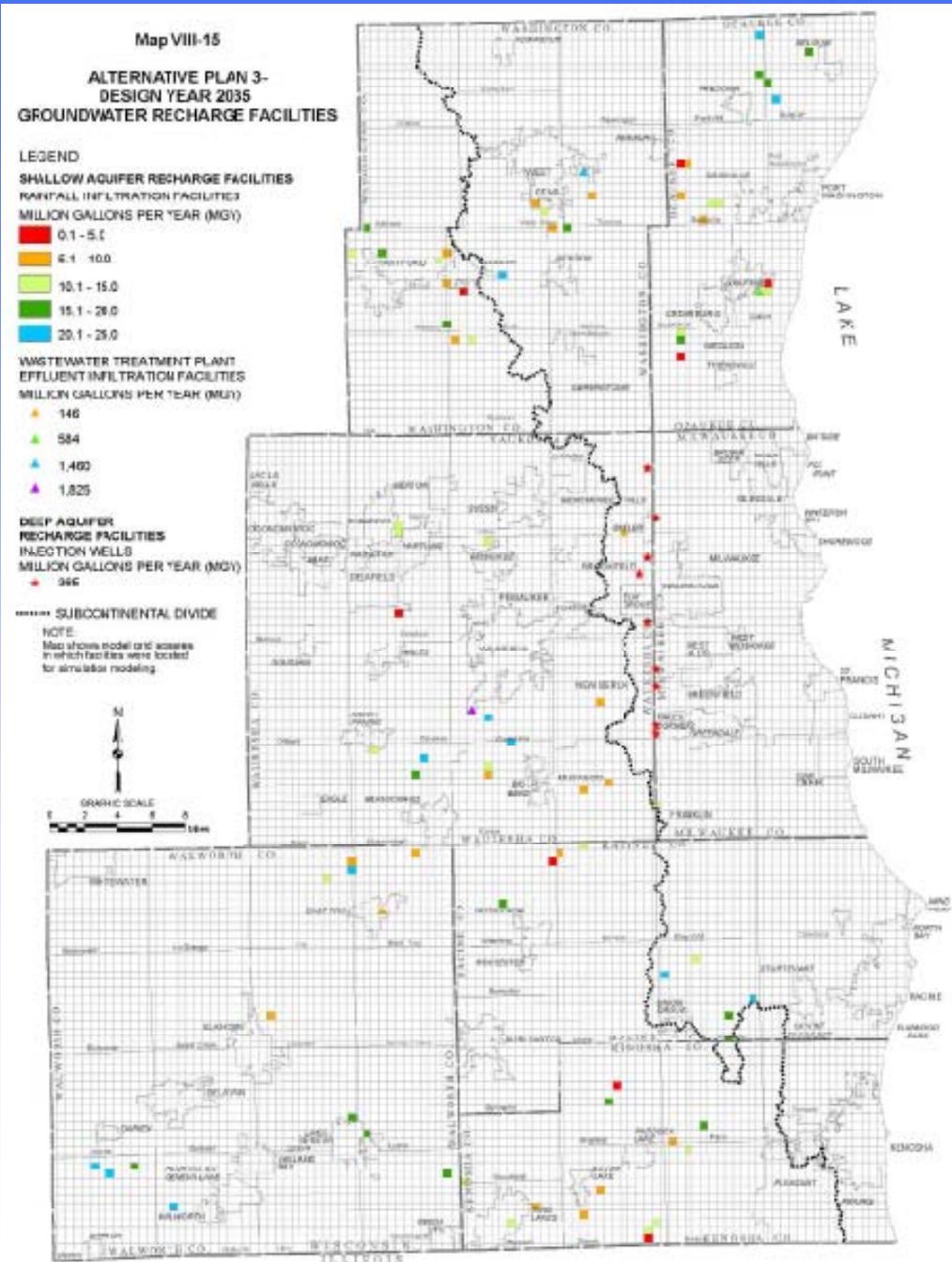
- Shallow aquifer recharge enhancement
  - Rainfall infiltration systems on environmental corridors, ag land, or other open lands
  - Groundwater recharge area protection/purchase
  - Treated wastewater infiltration systems
- Deep aquifer recharge enhancement
  - Injection of treated Lake Michigan drinking water

# SEWRPC Alternative Groundwater Recharge Proposal

*Rainfall  
Infiltration  
~4 mgd*

*Effluent  
Infiltration  
11 mgd*

*Deep Aquifer  
Injection  
9 mgd*



Source: SEWRPC Planning Report No. 52, <http://www.sewrpc.org/watersupplystudy/chapters.asp>

# Happy Thanksgiving!

See you next month...

