

GROUNDWATER IN THE GENEVA LAKE AREA, WALWORTH COUNTY, WISCONSIN

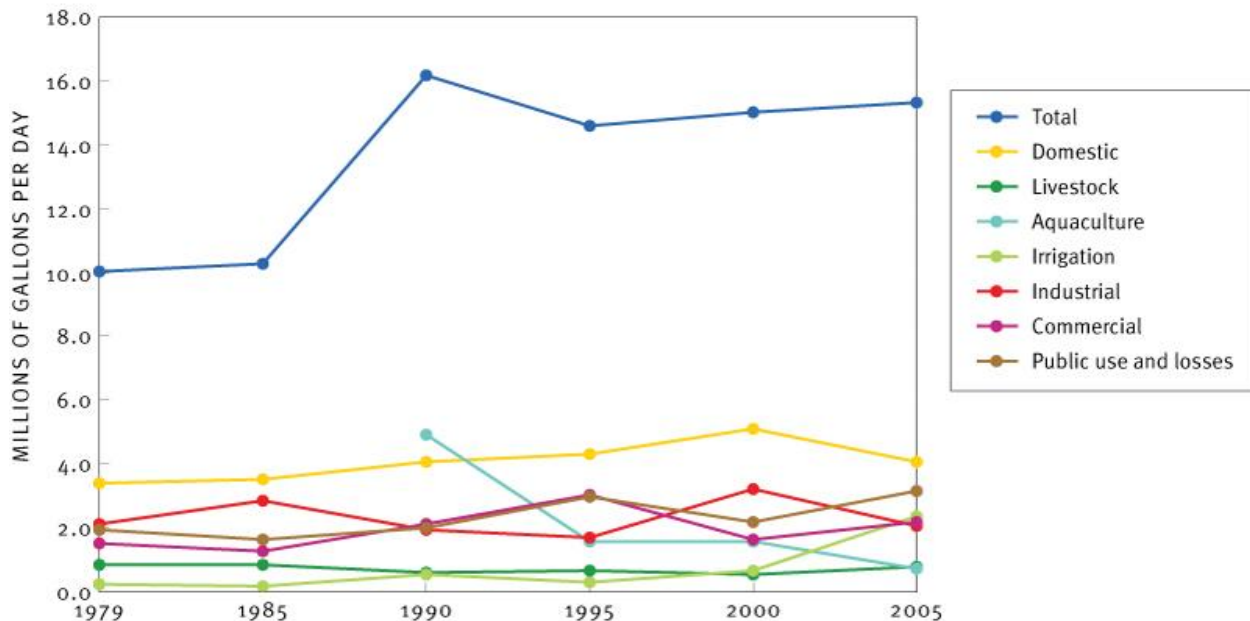
Prepared by the Geneva Lake Environmental Agency - 2010

The majority of this report was taken from the USGS website called "Protecting Wisconsin's Groundwater through Comprehensive Planning". It can be viewed at: http://wi.water.usgs.gov/gwcomp/find/walworth/index_full.html. Additional portions were added by the Geneva Lake Environmental Agency.

As of 2009:

- The Villages of Fontana and Williams Bay and the City of Lake Geneva use groundwater as the principal water source.¹ (2009 population 12,860)²
- The Linn Sanitary District comprises over 51.3 percent of Geneva Lake's watershed.³ There are over 1,900 improved parcels in the District that use groundwater as their principal water source.⁴

Walworth County water use by category

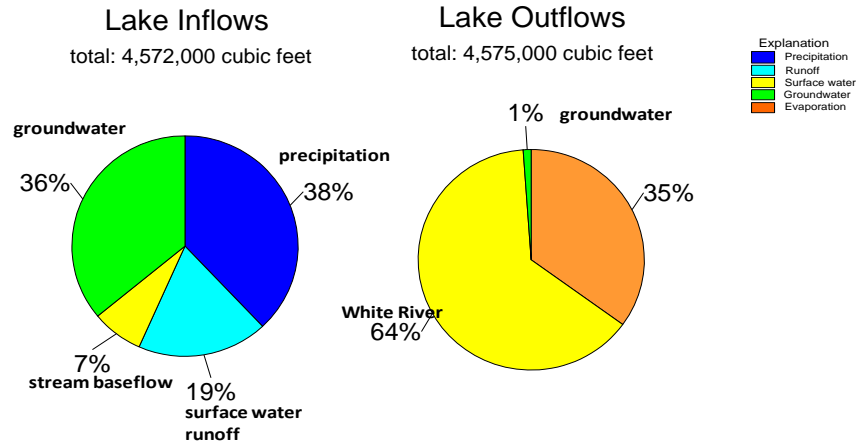


Water-use data from U.S. Geological Survey *Water Use in Wisconsin* reports for calendar years 1979, 1985, 1990, 1995, 2000 and 2005.

figure created for the "Protecting Wisconsin's Groundwater Through Comprehensive Planning" web site, 2007, <http://wi.water.usgs.gov/gwcomp/>

- From 1979 to 2005, total water use in Walworth County has increased from about 10.0 million gallons per day to 15.3 million gallons per day.¹
- The increase in total water use over this period is due to increases in all use categories.¹
- The proportion of county water use supplied by groundwater has increased from around 89% to about 99% during the period 1979 to 2005.¹
- It is conservatively estimated that the average person uses approximately 75 gallons of water a day.
- A recent study conducted in the Geneva Lake area has found that groundwater contributes 36% of the water that annually enters Geneva Lake.⁴

Geneva Lake's Water Budget -2006



Source: Wisconsin Geological and Natural History Survey

PROTECTION

- 11 of 16 municipal water systems in Walworth County have a wellhead protection plan: Darien, East Troy, Elkhorn, Fontana, Genoa City, Lake Geneva, Town of Lyons, Pell Lake, Sharon, Whitewater and Williams Bay.¹
- 8 of 16 municipal water systems in Walworth County have a wellhead protection ordinance: East Troy, Fontana, Genoa City, Lake Geneva, Town of Lyons, Pell Lake, Sharon and Whitewater.¹
- Walworth County has adopted an animal waste management ordinance that requires;
 - Permitting of animal waste storage facilities;
 - Permitting of new and expanding feedlots;
 - Nutrient management;
 - Prohibiting:
 - Overflow of manure storage structures;
 - Unconfined manure stacking or piling within areas adjacent to stream banks, lakeshores, and in drainage channels;
 - Direct runoff from feedlots or stored manure to waters of the state;
 - Unlimited livestock access to waters of the state where high concentrations of animals prevent adequate sod cover maintenance.
- Over \$24 million has been spent in Walworth County on petroleum cleanup from leaking underground storage tanks, which equates to \$241 per county resident.¹
- The Village of Fontana is the only municipal water system in Walworth County that has spent money to reduce nitrate levels. At a cost of \$1.2 million dollars they installed a new well to replace a well that had elevated nitrate levels. The cost per person was about \$648.¹
- To better understand the role of groundwater in the lives of area residents and its importance to Geneva Lake, the Geneva Lake Environmental Agency and the Wisconsin Geological and Natural History Survey have conducted several studies and inventories on groundwater in the Geneva Lake area.
- A map of the Geneva Lake area has been developed showing Geneva Lake's groundwater recharge areas. The darker the area the greater the infiltration. Dark areas should be protected from land use activities that could contribute to groundwater contamination. (Appendix 1)

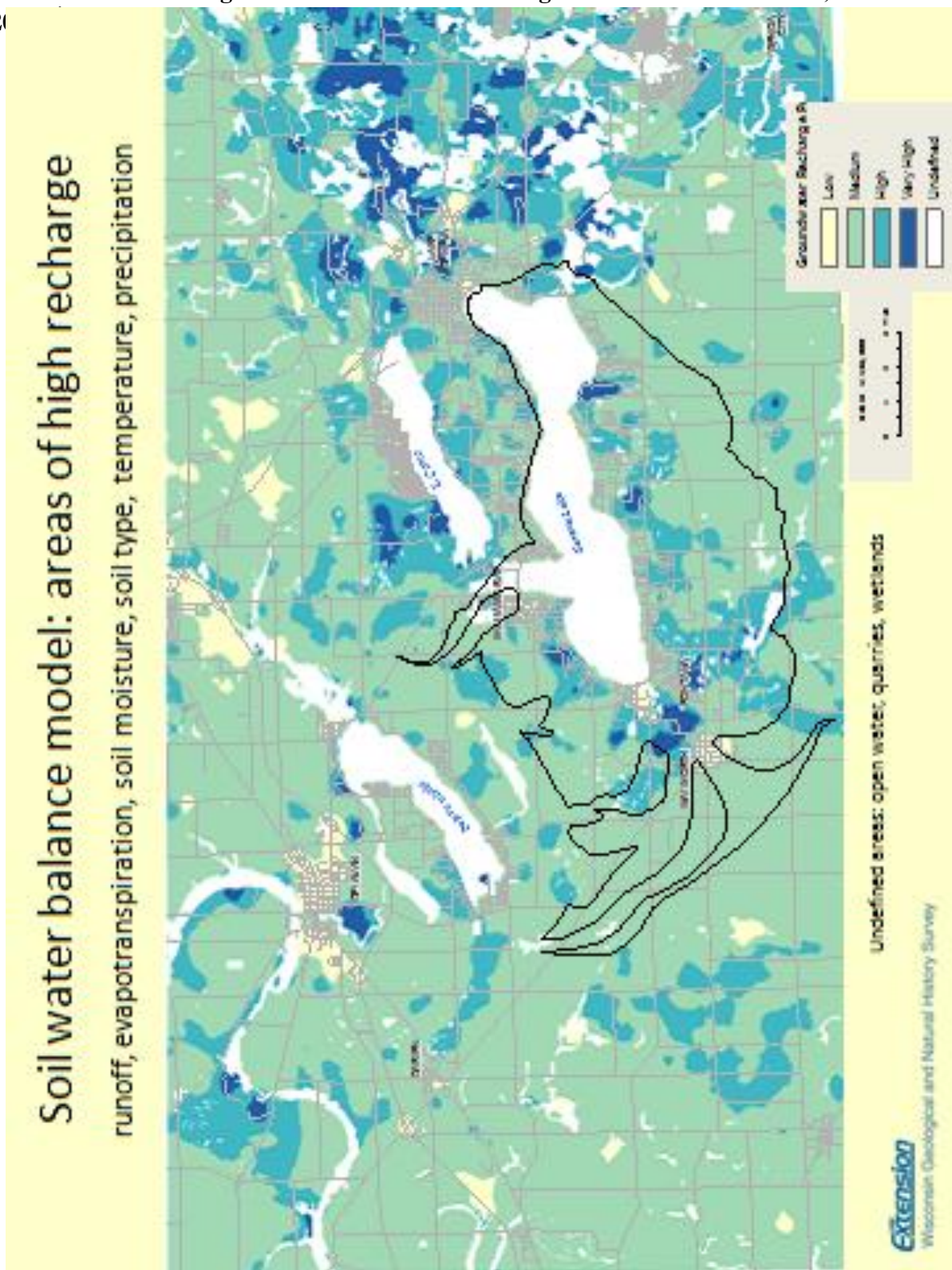
QUALITY ISSUES

- Groundwater can be polluted by a number of above and below ground sources (Appendix 2).
- 11% of the 340 private wells tested for nitrogen in Walworth County exceeded the health-based drinking water limit of 10 mg/l nitrate-nitrogen. Mostly in the northern ½ half of the County. (Appendix 3)
- A 2002 study estimated that 21% of private drinking water wells in the region of Wisconsin that includes Walworth County contained a detectable level of an herbicide or herbicide metabolite. (Appendix 4) Pesticides occur in groundwater more commonly in agricultural regions, but can occur anywhere pesticides are stored or applied.
- 5,128 acres of land in Walworth County are in atrazine prohibition areas. (Appendix 5).
- A sampling of 76 wells in the Geneva Lake area found 11% of those wells exceeded the health based standard for arsenic in drinking water (GLEA/WGNHS 2002). (Appendix 6)
- Other threats to quality that are being found in groundwater are volatile organic compounds, heavy metals, pharmaceuticals, personal care products and various salts.
- There are 172 open-status sites in Walworth County that have contaminated groundwater and/or soil. (Appendix 7) These sites include:
 - 52 Leaking Underground Storage Tank (LUST) sites,
 - 62 Environmental Repair (ERP) sites,
 - 56 spill sites and
 - 2 Voluntary Party Liability Exemption (VPLE) sites.
- There are 3 concentrated animal feeding operations (>1000 animal units) in Walworth County. (Appendix 8)
- There is 1 licensed landfill in Walworth County (Mallard ridge, Darien).
- There is 1 Superfund site in Walworth County (Delavan Municipal Well No. 4).

QUANTITY ISSUES

- During a 2006 study approximately 12.3 million gallons of water were contributed to Geneva Lake from the groundwater. Depending upon precipitation that can vary from 21 million gallons (33% of total) during a wet year and 8.7 million gallons(73% of total) during a dry year.⁴
- During the same period approximately 343,125 gallons were lost from Geneva Lake to the groundwater. That loss can range from 650,000 gallon (<1% of total) during a wet year and 1.9 million gallons (15%) during a dry year.⁴
- Precipitation recharges the shallow sand and gravel aquifer relatively fast. Most well water and the groundwater contribution to Geneva Lake comes from this aquifer.⁴
- Using numbers for population and water use per person, mentioned earlier in this report, on a normal summer day a conservative figure of 1.4 million gallons of groundwater are pumped from the Geneva Lake area for residential uses.
- The City of Lake Geneva and the Villages of Fontana and Williams Bay all discharge their wastewater outside of Geneva Lake's ground watershed.
- Through the use of on-site wastewater treatment systems, wastewater in the Town of Linn is discharged back to the groundwater relatively near to where it is withdrawn.
- High capacity wells on the west end of the lake intercept groundwater that would normally move towards and discharge to Geneva Lake lake.⁴
- To compensate for the loss of this intercepted water, the Geneva Lake ground watershed has advanced westerly approximately one mile.⁴

Appendix 1. Groundwater recharge areas with Geneva Lake's ground watershed defined, Walworth County, WI 20

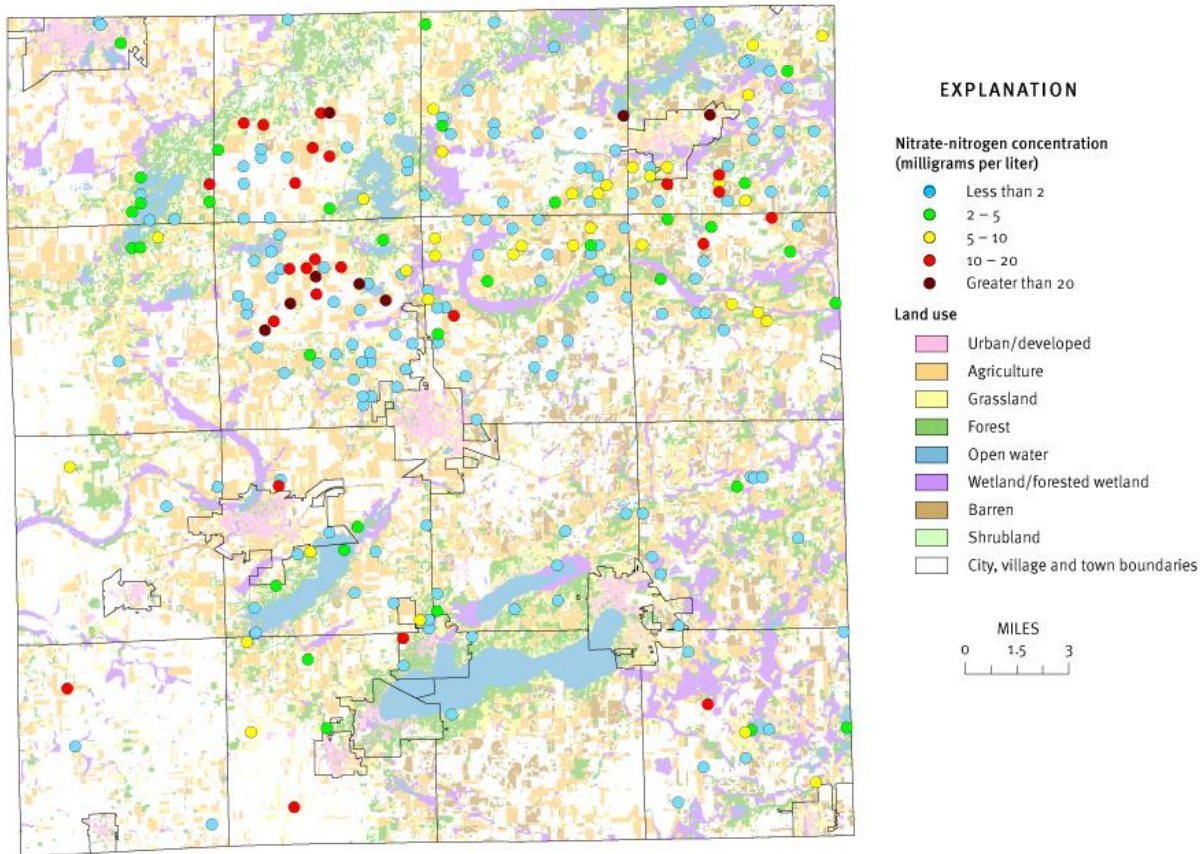


Appendix 2. (Source: USGS)¹

Place of Origin	Potential Pollution Sources			
	Municipal	Industrial	Agricultural	Other
Waste-related				
At or near the land surface	Sludge and wastewater disposal		Feedlots	Septage disposal
		Wastewater irrigation & landspreading	Manure storage and spreading Whey spreading	Junkyards
Below the land surface	Landfills		Manure pits	Septic systems Holding tanks
	Wastewater impoundments			
	Seepage cells			
	Sanitary sewers			
Non-waste				
At or near the land surface	Salt piles	Above and on the ground storage of chemicals		Highway deicing salt
	Snow piles	Stockpiles	Irrigation	Lawn fertilizers
	Contaminated stormwater infiltration	Spills	Fertilizers	Pesticides
		Tailing piles	Pesticides	
		Silage		
Below the land surface		Underground tanks		Improperly constructed and abandoned wells
		Pipelines		Over-pumping (induced pollution)

Appendix 3. (Source: USGS)¹

Walworth County – Nitrate-Nitrogen Concentrations



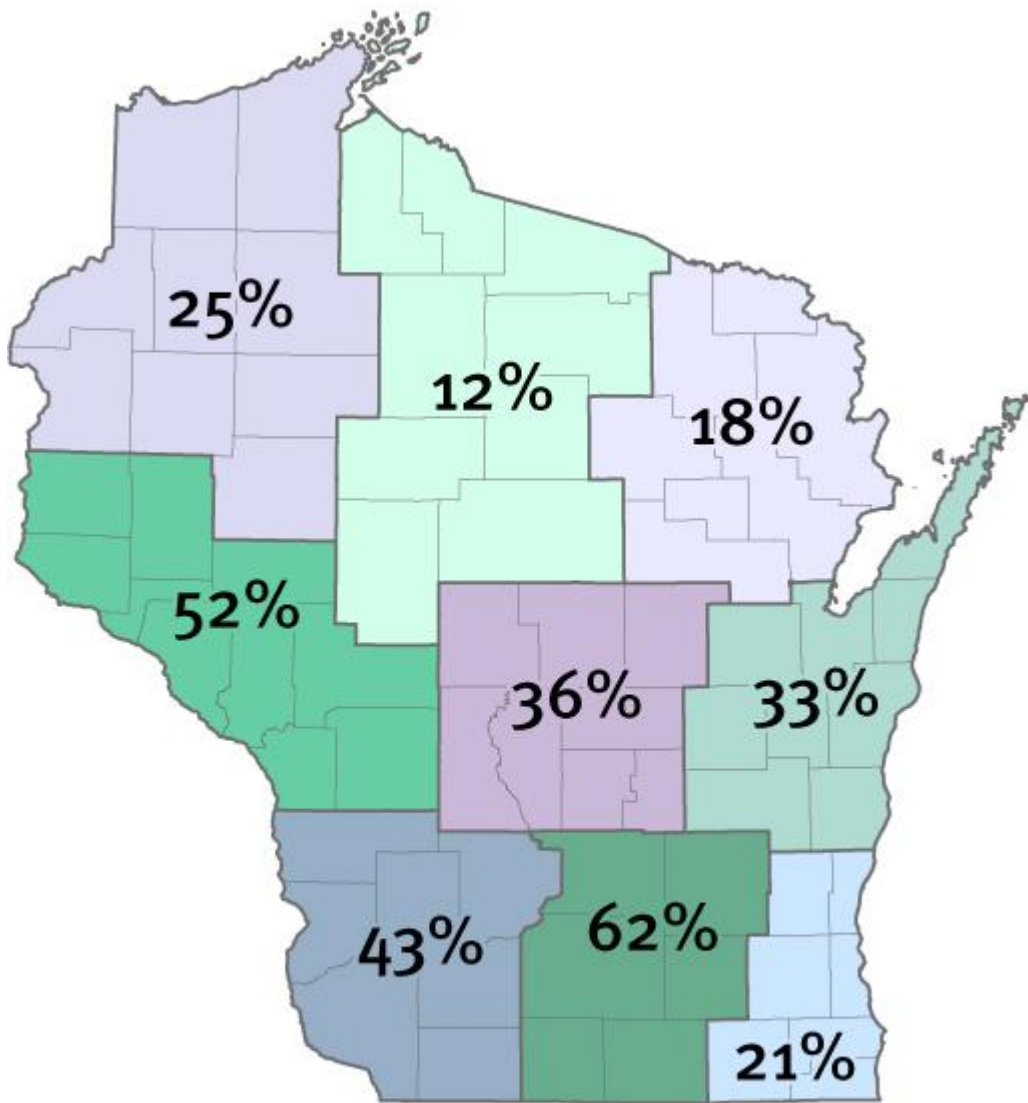
Private well nitrate-nitrogen data presented on this map should not be considered comprehensive. Data are from sampling conducted during 1985-2004 as reported by the Wisconsin Department of Natural Resources, the Wisconsin Department of Agriculture, Trade and Consumer Protection, and the Central Wisconsin Groundwater Center. Data collected at other times or by other sources are not included.

Land cover data: Wisconsin Department of Natural Resources, 1998, WISCLAND land cover (WLCGW930) 1991-1993, available at <http://www.dnr.state.wi.us/maps/gis/datalandcover.html>

Figure created by Raquel Miskowski, University of Wisconsin-Stevens Point, Center for Land Use Education, for the "Protecting Wisconsin's Groundwater Through Comprehensive Planning" web site, 2007, <http://wi.water.usgs.gov/gwcomp/>

Appendix 4. (Source: USGS)¹

Percentage of Private Wells with Detectable Herbicides or Herbicide Metabolites (2001)



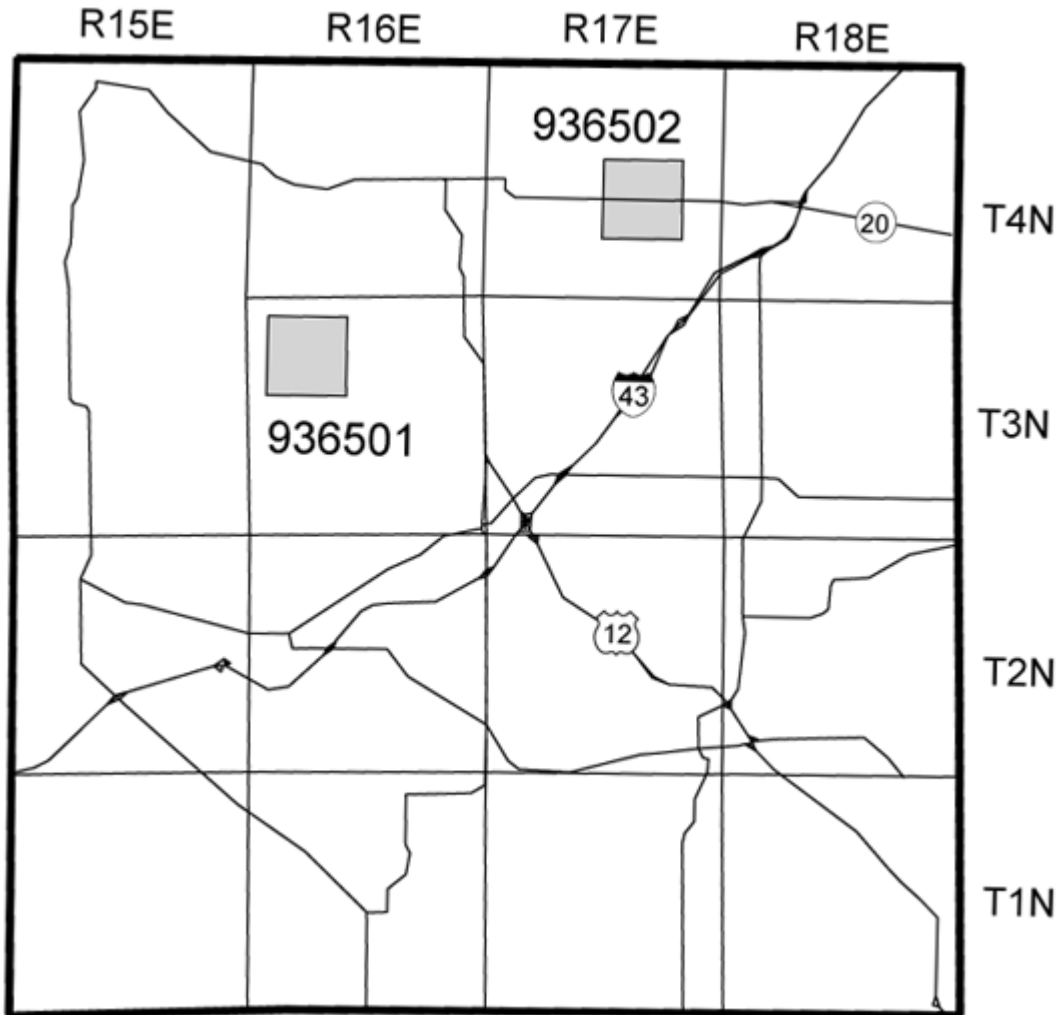
Herbicide data: Wisconsin Department of Agriculture, Trade and Consumer Protection, 2002, Agricultural chemicals in Wisconsin groundwater: final report, http://www.datcp.state.wi.us/arm/agriculture/land-water/enviro_n_quality/pdf/arm-pub-98.pdf

Figure created for the "Protecting Wisconsin's Groundwater Through Comprehensive Planning" web site, 2007, <http://wi.water.usgs.gov/gwcomp/>

Appendix 5.

ATRAZINE PROHIBITION AREAS IN WALWORTH COUNTY

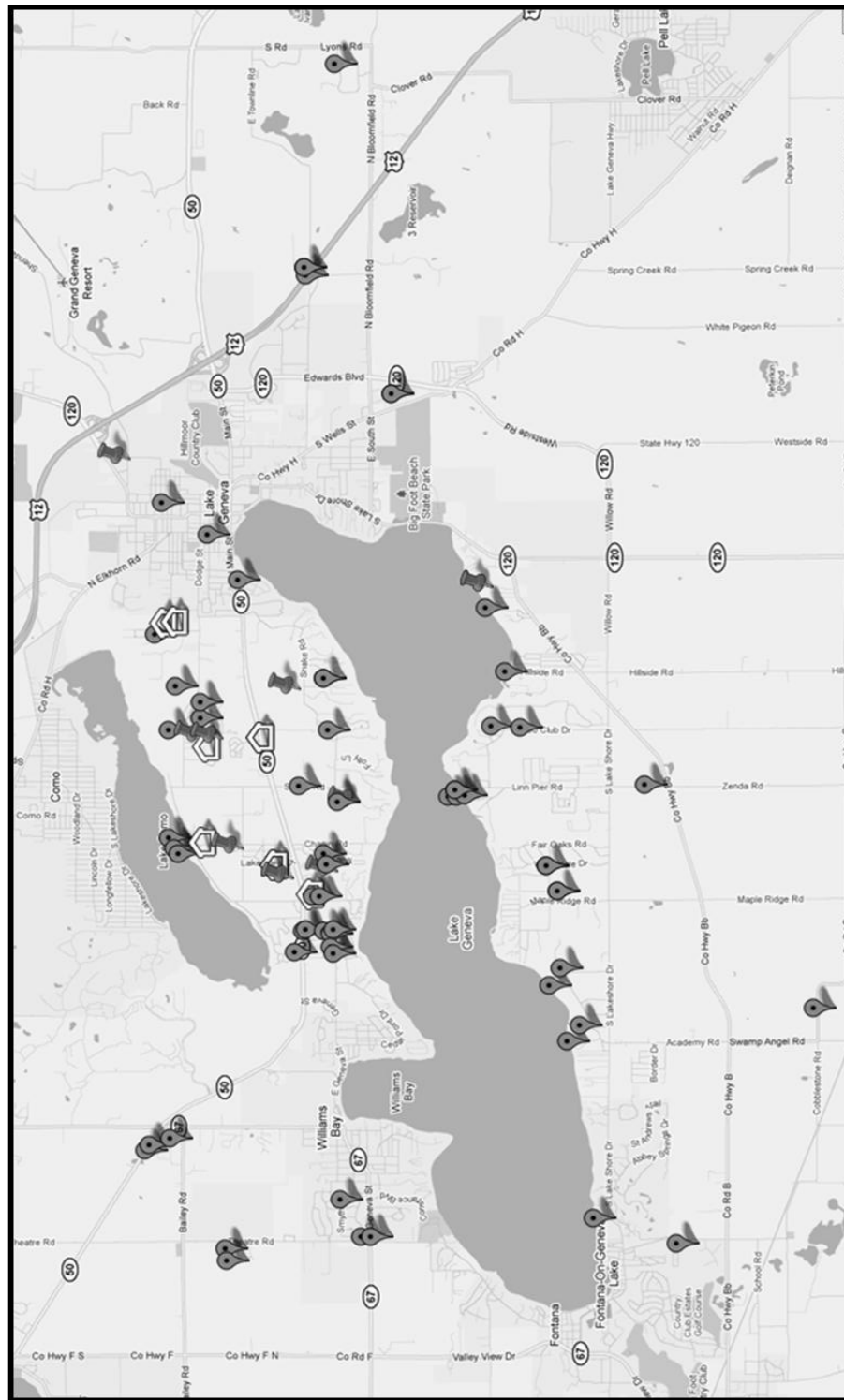
Areas where the use of the pesticide Atrazine is restricted due to environmental conditions and potential for groundwater pollution. .¹



Appendix 6. (Source: GLEA and WGNHS)

Private well test sites and results for arsenic in the Geneva Lake area, Walworth County, WI – 2002. ⁵

Private Well Testing for Arsenic
Geneva Lake Area, Walworth County, WI 2002



Appendix 7. (Source: USGS)

Open Status Sites in Walworth County With Contaminated Groundwater and/or Soil.¹

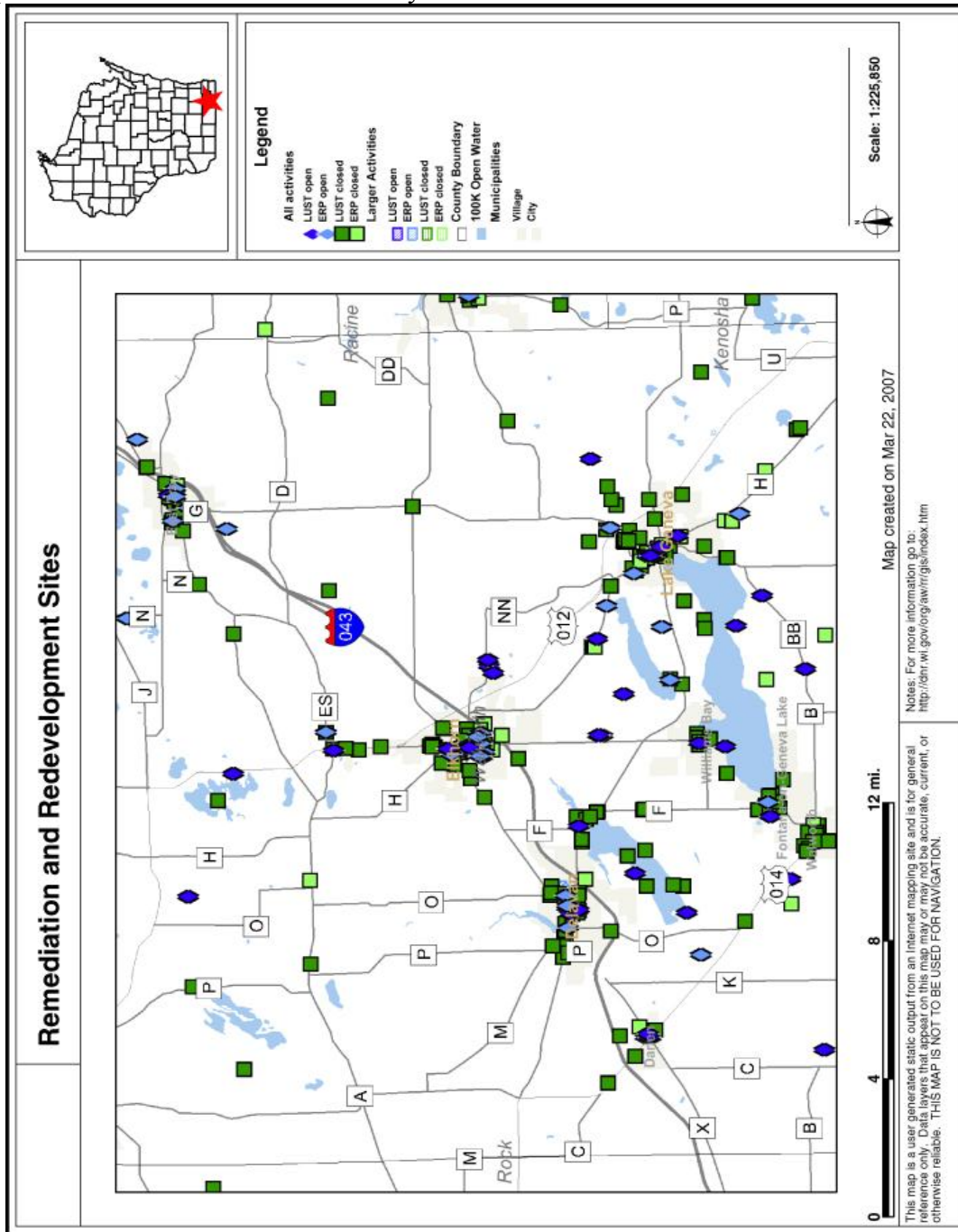


Figure created for the "Protecting Wisconsin's Groundwater Through Comprehensive Planning" web site, 2007. <http://wi.water.usgs.gov/gwcomp/>

Royal blue diamonds on the map indicate open leaking underground storage tank (LUST) sites which have contaminated soil and/or groundwater with petroleum, which includes toxic and cancer-causing substances. However, given time, petroleum contamination naturally breaks down in the environment. Turquoise diamonds on the map indicate open environmental repair (ERP) sites which are sites other than LUSTs that have contaminated soil and/or groundwater. Sites with boxes indicate they have been closed.

Appendix 8.

Concentrated Animal Feed Operations in Walworth County.¹

By definition, concentrated animal feed operations (CAFO) have greater than 1000 animal units. CAFOs are required under their Wisconsin Pollutant Discharge Elimination System (WPDES) permits to practice proper manure management and ensure that adverse impacts to water quality do not occur. Permit applicants must submit detailed information about the operation, a manure management plan, plans and specifications for all manure storage facilities, and a completed environmental analysis questionnaire. Once a WPDES CAFO permit is issued, operators must comply with the terms of the permit by following approved construction specifications and manure spreading plans, conducting a monitoring and inspection program, and providing annual reports.

There are three CAFOs in Walworth Country.

Holt Bros Farm Inc
6189 Amos Rd
Elkhorn, WI 53121
Type: Swine

Merry Water Farms Inc
N1240 Hillside Rd
Lake Geneva, WI 53147
Type: Dairy

S and R Egg Farms Inc. - LA GRANGE TN
Whitewater, WI 53190
Type: Chickens

REFERENCES.

- 1 Protecting Wisconsin's Groundwater Through Comprehensive Planning. Viewed at <http://wi.water.usgs.gov/gwcomup/find/walworth>, 2007.
- 2 www.city-data.com
- 3 Geneva Lake Water Quality Management Plan, SEWRPC, Community Assistance Planning Report #60, 1985, p17, table 4.
- 4 A Groundwater Flow Model for the Geneva Lake Area, Walworth Co. WI. Open file report 2009-02/2009. Madeline Gotkowitz, Johnathon Carter, WGNHS, UW-Ext.
- 5 Private well testing for arsenic in the Geneva Lake area, results unpublished, GLEA/WGNHS, 2002.