

**Presentation to the Groundwater
Special Subcommittee of the
Portage County Citizen Groundwater
Advisory Committee Regarding the
Need and Applicability of a Public
Health and Groundwater Protection
Ordinance**

Ray Reser and Pete Arntsen

Members of the

'New Hope Group'

*With special thanks to Anne Abbott, Public
Health Consultant, Abbott Solutions, Kevin
Masarik, Center for Watershed Science and
Education and Lynn Markham, Center for Land
Use Education, UW-Stevens Point for graphics
and technical assistance*

Who we are:

Pete Arnsten: Hydrogeologist with environmental consulting firm; 27 years of experience studying groundwater; licensed professional hydrologist; licensed professional geologist; master's and bachelor's degrees from CNR at UWSP, late-80s graduate student of Byron Shaw's investigating nitrate in groundwater, rural land owner



Ray Reser: PhD in Geosciences (Geoarchaeologist) with 30 years of experience working in Central Sands region. Adjunct professor of Geography/ Geology teaching water cycle, climate and basics of glacial geology and fluvial geomorphology. Grew up on small diversified farm in New Hope Township, rural land owner within an Atrazine Prohibition Area



We will presenting to the subcommittee on behalf of County residents. Please hold comments and questions until we move to follow-up discussions

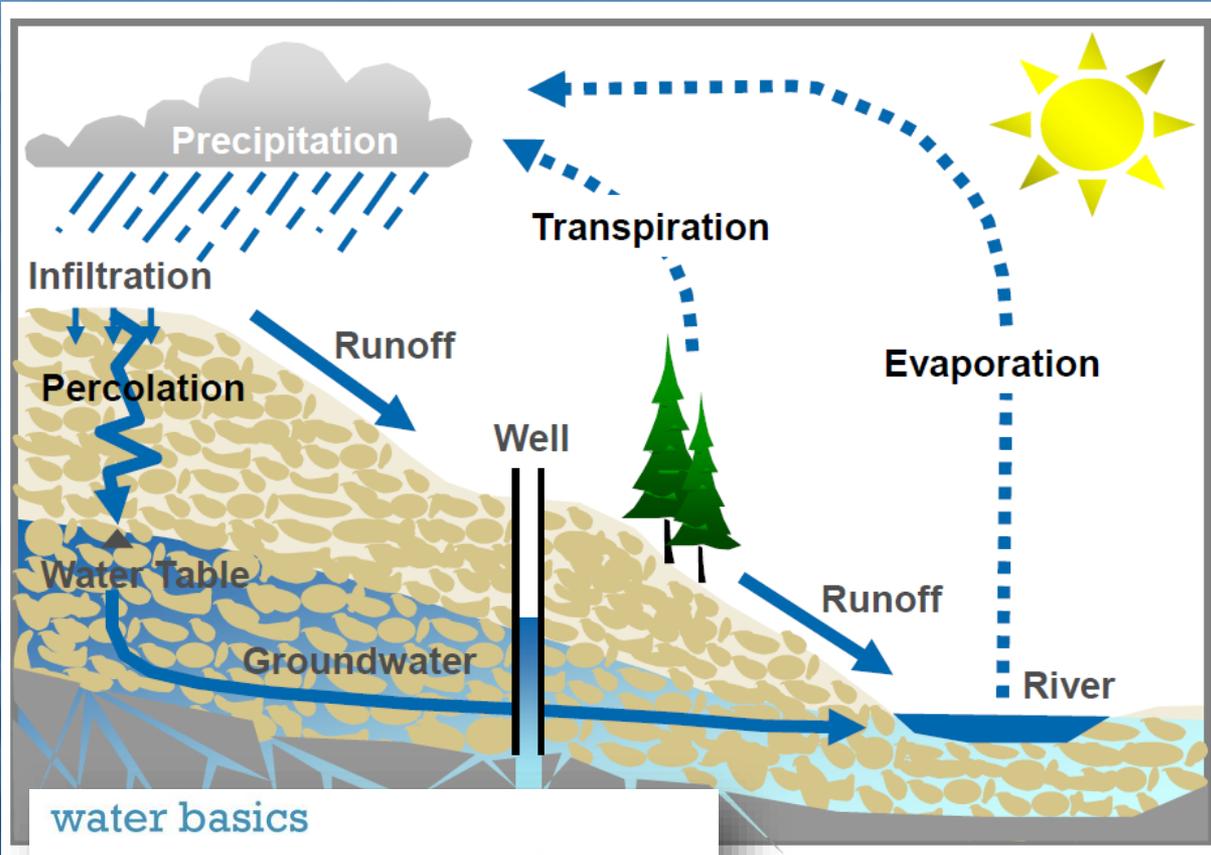
Groundwater is a critically important resource and Portage County has historically had access to abundant, high quality water

Drinking water: considered by many to be the *'highest and best use'* - a legal and economic term referring to a consensus on the value of a resource or property by multiple stakeholders.

"The wealth of the nation is its air, water, soil, forests, minerals, rivers, lakes, oceans, scenic beauty, wildlife habitats and biodiversity... that's all there is. That's the whole economy. That's where all the economic activity and jobs come from. These biological systems are the sustaining wealth of the world." Gaylord Nelson

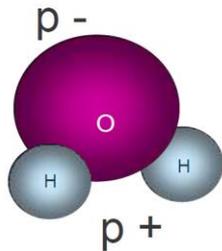


Groundwater and the Water Cycle



water basics

- "Universal Solvent"
- Naturally has "stuff" dissolved in it.
 - Impurities depend on rocks, minerals, land-use, plumbing, packaging, and other materials that water comes in contact with.
- Can also treat water to take "stuff" out



97% of Wisconsin's communities rely on groundwater for drinking water. 100% of Portage County does

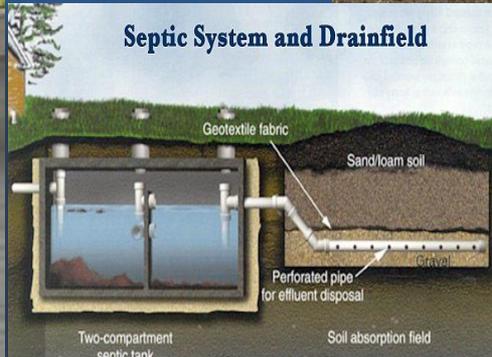
- Base flow for rivers and lakes and other aspects: guaranteed under Wisconsin's' Public Trust Doctrine, Wisconsin State Constitution
- Irrigation: Essential for some types of current regional farming practices
- **Groundwater is a LOCAL resource that benefits from local planning**

Our Groundwater Resources are also vulnerable due to permeable soils and porous glacial gravels over much of the County and fractured bedrock in other parts.

Human activities directly affect groundwater quality (e.g., spills, releases, land use)

Each can have effects on groundwater (urban areas, residential areas, agriculture, natural areas)

Concerns: Nitrogen sources/use
Environmental fate and transport of nitrogen
Nitrogen as an indicator of other contaminants



Factors affecting nitrogen loss to groundwater

Completely
Within our
control

- Amount of nitrogen applied
 - As a function of cropping system – **what we decide to plant**
 - Nitrogen application rate relative to economic optimum – **right amount**
- Percent of land base we decide to farm

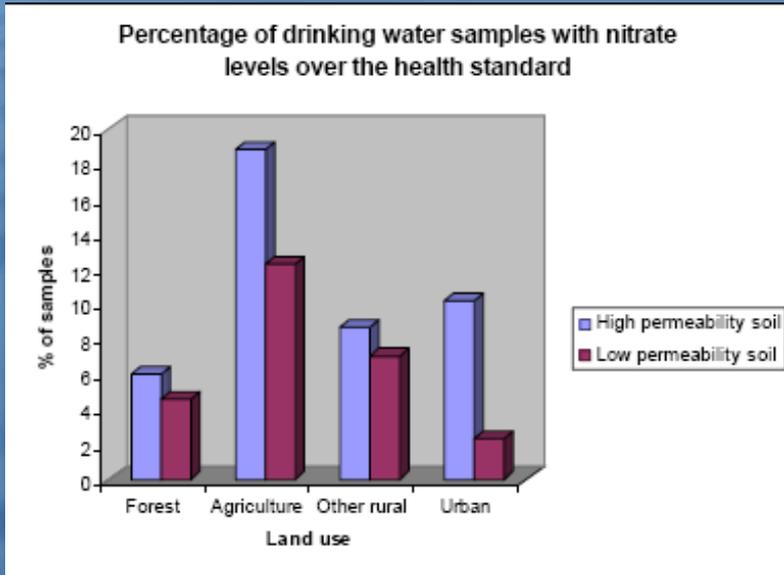
Risk
Management
strategies

- Nitrogen use efficiency
 - **Right form, right time, right placement**

Out of our
control

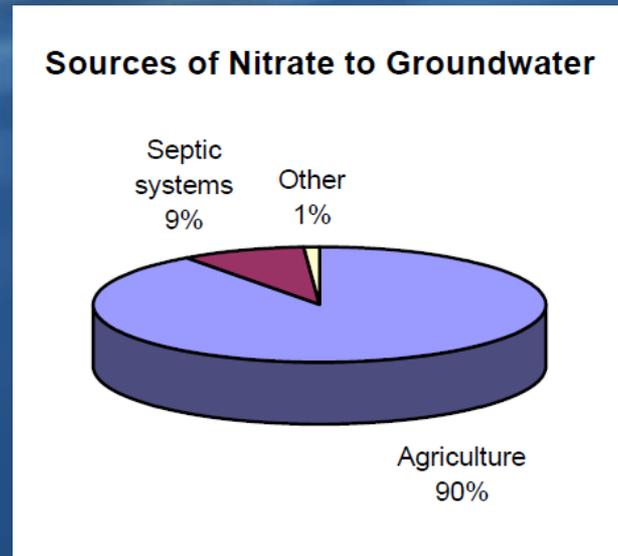
- Geology
- Soil Type
- Precipitation / Climate

Land use - nitrate connection



- Based on 35,000 samples from WI
- Drinking water is 3X more likely to exceed the nitrate standard in agricultural areas compared to forested areas
- High nitrate levels are also more common in sandy areas where the soil is more permeable

Source Wisconsin DNR



Wells contaminated with high nitrate levels are more likely to be contaminated with agricultural pesticides, pharmaceuticals and other chemicals

Why contaminated drinking water is bad

- **Cancer.** In the human body, nitrate can convert to nitrite and then to N-nitroso compounds, which are some of the strongest known carcinogens. As a result, additional human health concerns related to nitrate contaminated drinking water include increased risk of
 - non-Hodgkin's lymphoma
 - stomach cancer
 - bladder and ovarian cancer in older women
- In fish, amphibians, and aquatic invertebrates nitrate can cause serious health issues and can lead to death

Nitrate-Nitrogen

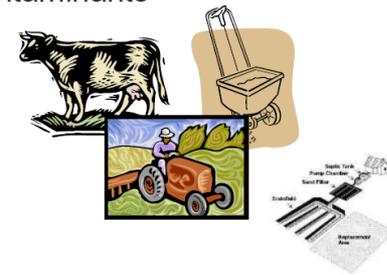
Health Effects:

- Methemoglobinemia (blue baby disease)
- Possible links to birth defects and miscarriages (humans and livestock)
- Indicator of other contaminants



Sources:

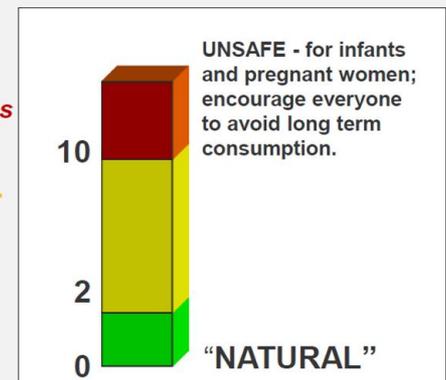
- Agricultural fertilizer
- Lawn fertilizer
- Septic systems
- Animal wastes



Test Important to Health

Nitrate Nitrogen

- **Greater than 10 mg/L**
Exceeds State and Federal Limits for Drinking Water
- **Between 2 and 10 mg/L**
Some Human Impact
- **Less than 2.0 mg/L**
"Transitional"
- **Less than 0.2 mg/L**
"Natural"



Nitrate Trends Community water systems (bars, restaurants, churches, trailer parks, etc.)

Portage County:

Number of wells: 118

% Decreasing: 11

% No Trend: 67

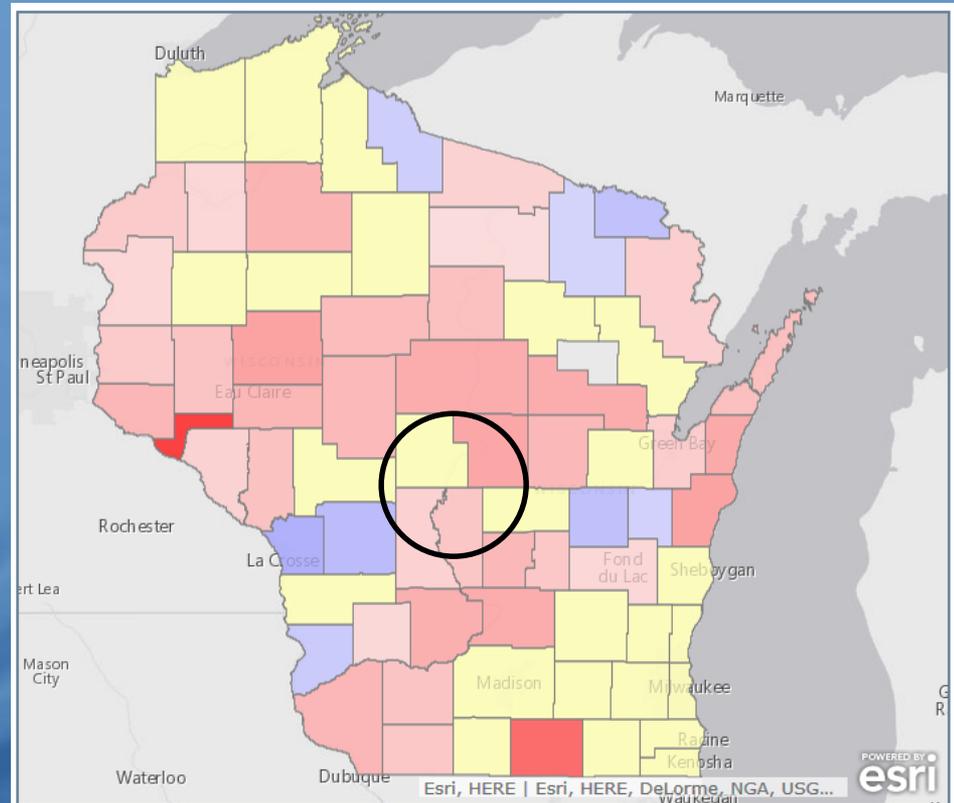
% Increasing: 22

Nitrate Concentration Mean (mg/L): 4.66

% Over 10 mg/L: 10.6

% Over 5 mg/L: 31.8

Over 10% of these community water systems exceed the drinking water standard, and almost 1/3 are approaching the standard



The information shown on these maps has been obtained from various sources, and are of varying age, reliability and resolution. These maps are not intended to be used for navigation, nor are these maps an authoritative source of information about legal land ownership or public access. Users of these maps should confirm the ownership of land through other means in order to avoid trespassing. No warranty, expressed or implied, is made regarding accuracy, applicability for a particular use, completeness or legality of the information depicted on this map.

WI Dept. of Natural Resources, 2016

Our collective groundwater resources are protected through the Wisconsin Public Trust Doctrine

*“It holds that the state is the trustee of the waters of the state for the benefit of the people of the state,” “And so the trustee has a duty to care for, manage, improve and protect the water for the benefit of the citizens. **It’s not as if the state owns the water, but the people are the beneficial owners of water, just as the beneficiaries of a trust.**” “The idea that as the doctrine evolved, it was read to protect a variety of rights of water including the right to recreate, to fish, to hunt game, to enjoy scenic beauty and **to enjoy clean and healthy water.**”*

Arlen Christensen, Senior Professor of Law and Environmental Studies, University of Wisconsin Madison Law School.

Current contamination of public groundwater can be addressed, fixed, and prevented locally

Use and overuse of public groundwater can be regulated locally

Farming has been practiced for 3000 years in Portage County, with corn grown for at least the last 1000.... We are obligated do this right



Existing Statutes, Codes, and Rules Pertaining to Groundwater Protection

Environmental Protection Agency

- Safe Drinking Water Act

Wisconsin Administrative Codes

- NR 140 Groundwater Quality
- NR 151 Runoff Management
- ATCP 50 Soil and Water Resource Management Program

Portage County Ordinances

- Chapter 4 Health and Sanitation
- Chapter 7 Zoning Ordinances

NR 140 - Groundwater Quality

NR 140.01 Purpose. The purpose of this chapter is to establish groundwater quality standards for substances detected in or having a reasonable probability of entering the groundwater resources of the state

Table 1 – Continued
Public Health Groundwater Quality Standards

| Substance ¹ | Enforcement Standard (micrograms per liter – except as noted) | Preventive Action Limit (micrograms per liter – except as noted) |
|--|---|--|
| Methanol | 5000 | 1000 |
| Methoxychlor | 40 | 4 |
| Methylene chloride | 5 | 0.5 |
| Methyl ethyl ketone (MEK) | 4 mg/l | 0.8 mg/l |
| Methyl isobutyl ketone (MIBK) | 500 | 50 |
| Methyl tert-butyl ether (MTBE) | 60 | 12 |
| Metolachlor/s–Metolachlor | 100 | 10 |
| Metolachlor ethane sulfonic acid + oxanilic acid (Metolachlor – ESA + OXA) | 1.3 mg/l | 0.26 mg/l |
| Metribuzin | 70 | 14 |
| Molybdenum | 40 | 8 |
| Monochlorobenzene | 100 | 20 |
| Naphthalene | 100 | 10 |
| Nickel | 100 | 20 |
| Nitrate (as N) | 10 mg/l | 2 mg/l |
| Nitrate + Nitrite (as N) | 10 mg/l | 2 mg/l |
| Nitrite (as N) | 1 mg/l | 0.2 mg/l |
| <i>N</i> -Nitrosodiphenylamine | 7 | 0.7 |
| Pentachlorophenol (PCP) | 1 | 0.1 |

NR 140.26 Responses when an enforcement standard is attained or exceeded

Range of Responses for Exceedance of Enforcement Standards for Substances of Health or Welfare Concern

1. Require a **revision of the operational procedures** at a facility, practice or activity.
2. Require a **change in the design** or construction of the facility, practice or activity.
3. Require an **alternate method** of waste treatment or disposal.
4. Require **prohibition or closure** and abandonment of a facility, practice or activity.
5. Require **remedial action to renovate** or restore groundwater quality.
6. Require **remedial action to prevent** or minimize the further release of the substance to groundwater.
7. **Revise rules** or criteria on facility design, location or management practices.
8. Require the **collection and evaluation of data** to determine whether **natural attenuation** can be effective to restore groundwater quality within a reasonable period of time, considering applicable criteria specified in ss. NR 140.24, 722.07 and 722.09 or 722.11, and require monitoring to determine whether or not natural attenuation is occurring in compliance with the requirements of s. NR 140.26 (2) (a).

NR 151 Runoff Management

Subchapter II — Agricultural Performance Standards and Prohibitions

NR 151.001 **Purpose.** This chapter establishes ... performance standards and prohibitions for agricultural facilities and practices designed to achieve water quality standards as required by s. [281.16 \(2\)](#) and [\(3\)](#), Stats...

NR 151.07 **Nutrient management.**

- (1) **All crop producers** and livestock producers that apply manure or other nutrients directly or through contract to agricultural fields **shall comply with this section.**
- (3) Manure, commercial fertilizer and other **nutrients shall be applied in conformance with a nutrient management plan.**
 - (a) The nutrient management plan shall be designed to **limit or reduce the discharge of nutrients to waters of the state for the purpose of complying with state water quality standards and groundwater standards.**

NR 151.09 Implementation and enforcement procedures for cropland performance standards

- (2) **Role of Municipalities.** The department may rely on municipalities to implement the procedures and make determinations established in this section.

Note: In most cases, the department will rely on municipalities to fully implement the cropland performance standards.

- (3) **Landowner and Operator Requirements.**

- (a) *Introduction.* This section identifies compliance requirements for landowners and operators based on whether the cropland is existing or new and whether cost sharing is required and made available to the landowner or operator.

ATCP 50 Soil and Water Resource Management Program

Subchapter II — Soil and Water Conservation on Farms

ATCP 50.04 Farm conservation practices.

Except as provided in s. [ATCP 50.08](#), a landowner engaged in agricultural practices in this state shall implement the following conservation practices:

- (1) **Nonpoint Source Pollution Control.** A landowner shall implement conservation practices that achieve compliance with DNR performance standards under ss. [NR 151.02](#) to [151.08](#), in effect on May 1, 2014.
- (3) **Nutrient management plan.**
 - (a) **A landowner shall have and follow an annual nutrient management plan** when applying nutrients to any field, including pastures, after the date specified in par. [\(h\)](#). A nutrient management plan shall comply with this subsection.
 - (e) The plan shall comply with the **NRCS technical guide nutrient management standard 590**
 - (f) The plan may not recommend nutrient applications that exceed the amounts required to achieve applicable crop fertility levels recommended by the University of Wisconsin-Extension in the 2006 edition of *Nutrient Application Guidelines for Field, Vegetable and Fruit Crops*, UWEX publication A2809

ATCP 50.08 Cost-sharing required

- (1) General. A landowner engaged in agricultural practices in this state is not required to do any of the following, under s. [ATCP 50.04](#), unless the landowner receives a bona fide offer of cost-sharing:

ATCP 50.14 County ordinances. A county may, by ordinance, require landowners to implement conservation practices required under s. [ATCP 50.04](#).

ATCP 50.78 Nutrient management.

- (1) Definitions. In this section, "nutrient management" means **controlling the amount, source, form, location, and timing** of plant nutrient applications, including application of organic wastes, commercial fertilizers, soil reserves, and legumes, in order to provide plant nutrients **while minimizing the movement of nutrients to surface water and groundwater.**

NRCS Conservation Practice Standard: Nutrient Management Code 590

Definition

Managing the amount (rate), source, placement (method of application), and timing of plant nutrients and soil amendments.

Purpose

- To budget, supply, and conserve nutrients for plant production.
- To minimize agricultural nonpoint source pollution of surface and groundwater resources.
- To properly utilize manure or organic by-products as a plant nutrient source.
- To protect air quality by reducing odors, nitrogen emissions (ammonia, oxides of nitrogen), and the formation of atmospheric particulates.
- To maintain or improve the physical, chemical, and biological condition of soil.

Nutrient Application Guidelines for Field, Vegetable and Fruit Crops, UWEX publication A2809

Chapter 6. Nitrogen - Nitrogen application rate guidelines

Most non-legume crops need additional nitrogen (N) to improve crop yield and quality and to optimize economic return to the grower. However, **excess N can reduce yields and lower the quality of some crops. Excess N can also cut economic returns to producers, degrade water quality, and cause other undesirable environmental effects.** Wisconsin's N rate guidelines are based on crop yield, quality, and economic return. Using these guidelines will help to minimize excess N applications and reduce environmental risks. These guidelines are based on field studies where crop responses to several rates of N are measured on soils typically used for production of various crops. Nitrogen application rate guidelines vary according to the crop to be grown, soil characteristics and yield potential, and soil organic matter content.

Table 6.1. Suggested nitrogen (N) application rates for corn at different nitrogen:corn grain price ratios.

| Soil and previous crop | Nitrogen:Corn price ratio | | | |
|---|--|---------------------------|---------------------------|---------------------------|
| | 0.05 | 0.10 | 0.15 | 0.20 |
| | ----- total lb N/a to apply ^a ----- | | | |
| Loamy: high yield potential soil | | | | |
| Corn, forage legumes, legume vegetables, green manures ^d | 190^b 170-----210 ^c | 165 155-----180 | 150 140-----160 | 135 125-----150 |
| Soybean, small grains ^e | 140 125-----160 | 120 105-----130 | 105 95-----115 | 90 80-----105 |
| Loamy: medium yield potential soil | | | | |
| Corn, forage legumes, legume vegetables, green manures ^d | 145 130-----160 | 125 115-----140 | 115 105-----125 | 105 95-----110 |
| Soybean, small grains ^e | 130 110-----150 | 100 85-----120 | 85 70-----95 | 70 60-----80 |
| Sands/ loamy sands | | | | |
| Irrigated—all crops ^d | 215 200-----230 | 200 185-----210 | 185 175-----195 | 175 165-----185 |
| Non-irrigated—all crops ^d | 140 130-----150 | 130 120-----140 | 120 110-----130 | 110 100-----120 |

^a Includes N in starter.

^b Rate is the N rate that provides the maximum return to nitrogen (MRTN).

^c Range is the range of profitable N rates that provide an economic return to N within \$1/a of the MRTN rate.

^d Subtract N credits for forage legumes, legume vegetables, animal manures, and green manures. This includes first-, second-, and third-year credits where applicable. Do not subtract N credits for leguminous vegetables on sand and loamy sand soils.

^e Subtract N credits for animal manures and second-year forage legumes.

What Other Municipalities Have Done

Kewaunee County

- Groundwater Collaboration Workgroup
 - EPA, DNR, County, and local groups assembled in response to concerns over contaminated drinking water wells
- Public Health and Groundwater Protection Ordinance

Town of Saratoga

- Livestock Operation Ordinance

DRAFT Portage County Public Health and Groundwater Protection Ordinance

Authority. This ordinance is adopted under authority granted by ss. 59.02, 59.03, 59.70, 60.22, 61.34, 92.11, and 92.15 Wisconsin Statutes.

92.11 Regulation of local soil and water resource management practices.

(1) Proposed ordinances. **To promote soil and water conservation** or nonpoint source water pollution abatement, **a county, city, village or town may enact ordinances** for the regulation of land use, land management and pollutant management practices.

“In light of the discussion on groundwater quality and quantity in the preceding paragraphs, clearly, the Wisconsin Administrative Code covering land application of wastes, agricultural practices, and high capacity well operation, in general, are inadequate for protecting human health and wellbeing with regard to the County's groundwater. Furthermore, the existing County ordinances do not do enough to supplement the shortcomings of the State Codes.”