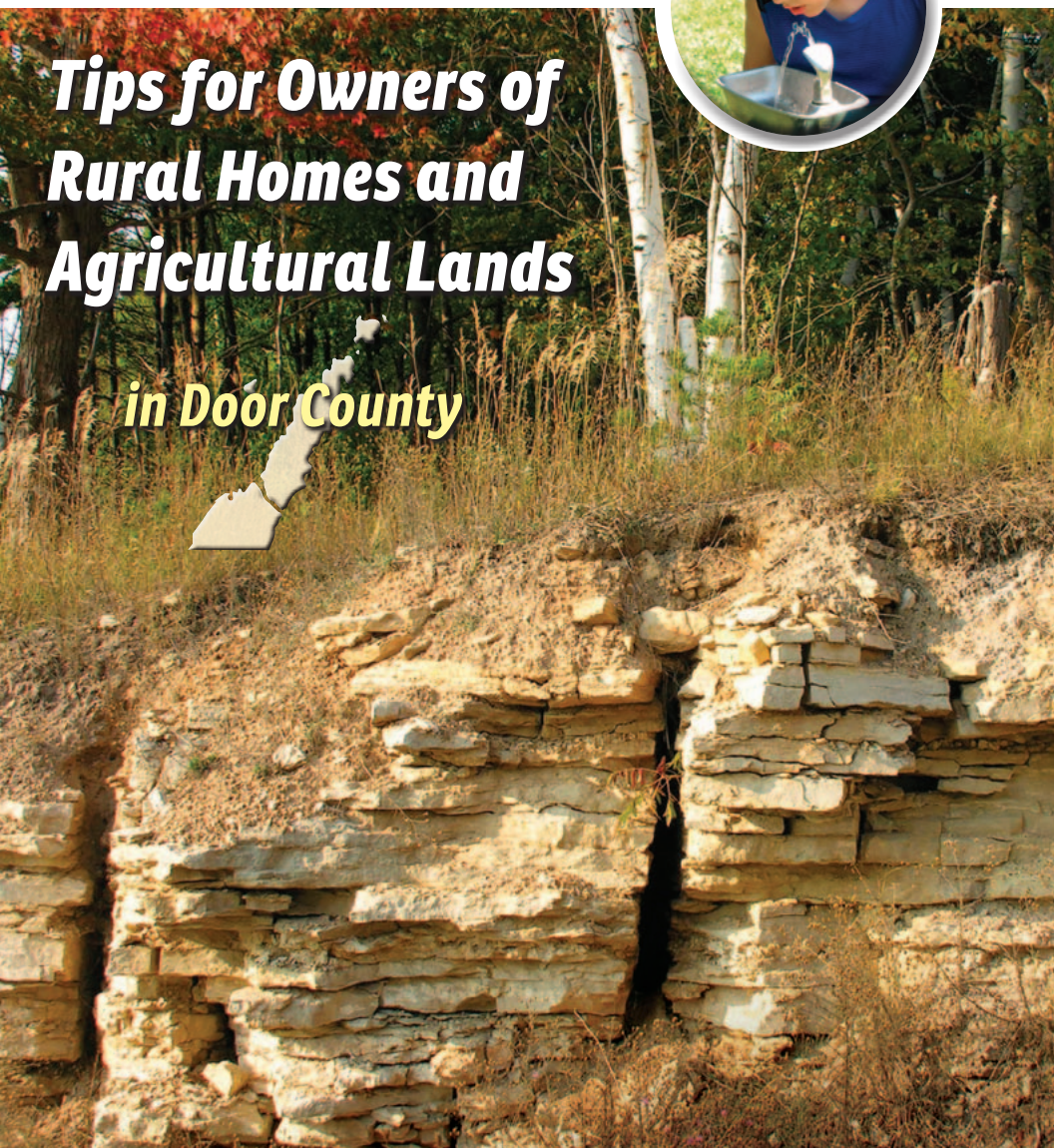


Protect the Water You Drink



Tips for Owners of Rural Homes and Agricultural Lands

in Door County



DOOR COUNTY

UW
Extension
Basin Education Initiative

*Fractured bedrock combined with
thin soils creates a high potential
for water contamination.*



A large surface crack in Door County bedrock is cleared to locate a sinkhole outlet.



Spring runoff flows to a large sinkhole, where it descends underground.

In Door County, drinking water has a high potential for contamination

Although Door County is nearly surrounded by Green Bay and Lake Michigan, most residents rely on groundwater, rather than lake water, for drinking. Sampling results have shown that at any one time in Door County, at least one-third of the private wells can contain bacteria.

Groundwater typically moves less than 1 foot per day, but in Door County's thin soil and fractured bedrock, water and pollutants can move 100 feet or more per day. One sinkhole contamination incident showed that water moved one mile in an hour! Such rapid movement means wells can test safe one day and be contaminated the next.

There are significant health concerns when pollutants reach residential wells, beaches, lakes, rivers, and streams. Pollution on the surface of the land can directly and quickly impact water underground.

The groundwater that is pumped by your well likely began as rain or snow falling on the land you see from your home.



Protect the water you drink – [Learn about it](#)

Woodlands help protect exposed and cracked bedrock from runoff.

Shallow soils over fractured bedrock allow water and contaminants to travel rapidly

The unique geology and soils of Door County present extreme challenges in protecting groundwater. The upper layer of bedrock is a type of rock that is easily dissolved by water. Extensive networks of vertical and horizontal fractures (cracks) in the bedrock are continuously forming. Sinkholes, disappearing streams, and caves are visible examples of places where bedrock has dissolved.

Door County's soil is generally very shallow (see map on pages 4-5). Soil is important for protecting water quality, because it naturally filters contaminants picked up by rainwater and snowmelt before they reach groundwater, rivers, lakes and streams. Since the soil is so shallow in Door County, there is little to no natural filtering of contaminants.

The term "karst" refers to areas like Door County where bedrock is dissolved by water, resulting in features like caves, sinkholes and disappearing streams.



How Deep is Your Soil?

Soils of Door County, Wisconsin

In Door County's karst landscape, many of the soils are shallow, especially in the northern two-thirds of the peninsula where there is predominantly the Summerville-Longrie-Omena soil type (shown in beige) and typically less than 3 feet of soil over fractured bedrock.

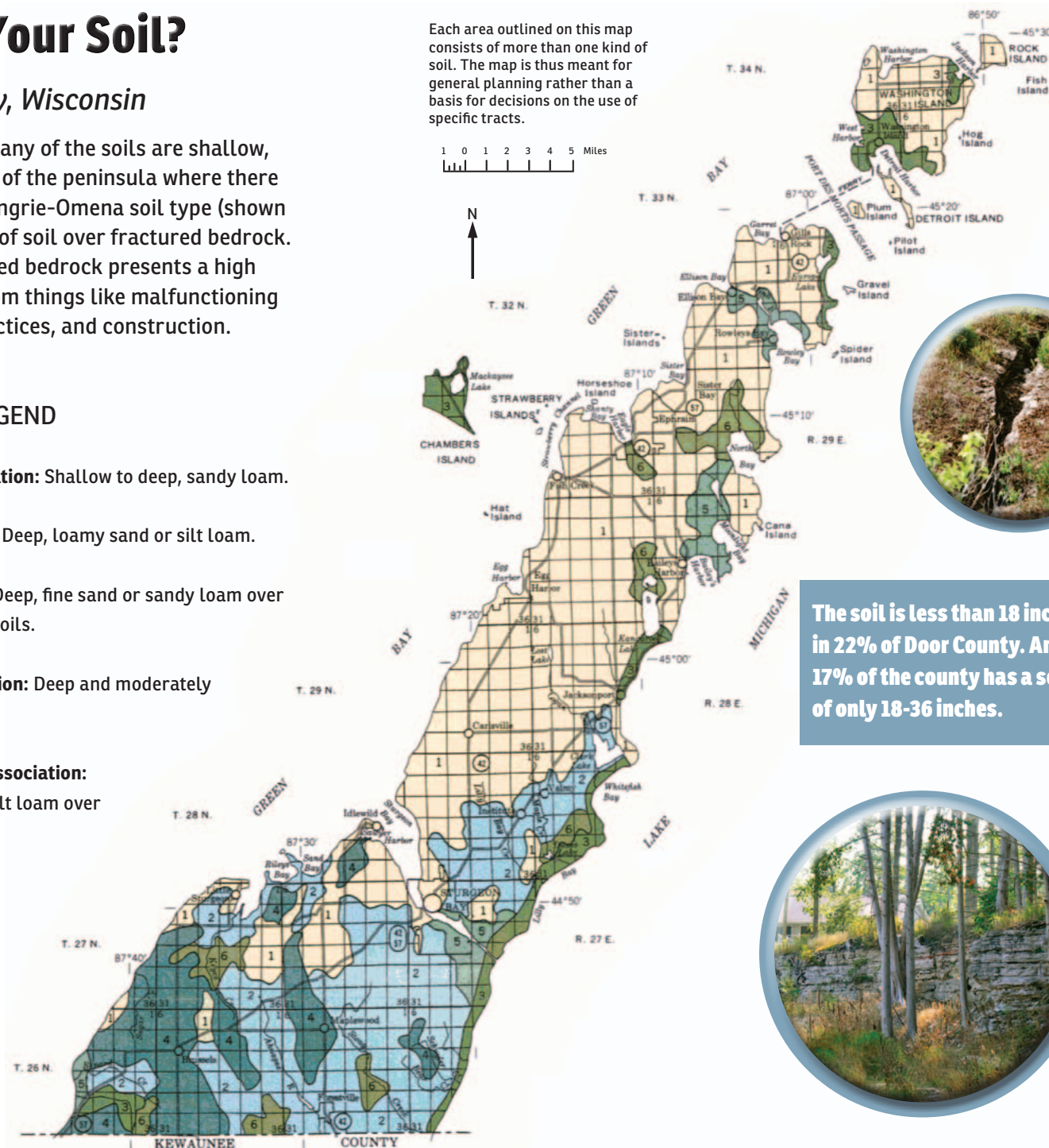
The shallow soil depth and fractured bedrock presents a high potential for water contamination from things like malfunctioning septic systems, agricultural practices, and construction.

SOIL LEGEND

- 1 **Summerville-Longrie-Omena association:** Shallow to deep, sandy loam.
- 2 **Emmet-Solona-Angelica association:** Deep, loamy sand or silt loam.
- 3 **Rousseau-Kiva-Markey association:** Deep, fine sand or sandy loam over sand or sand and gravel and organic soils.
- 4 **Kewaunee-Kolberg-Manawa association:** Deep and moderately deep, silty clay.
- 5 **Deford-Yahara Variant-Carbondale association:** Deep soils underlain by fine sand or silt loam over lake sediments and organic soils.
- 6 **Carbondale-Cathro association:** Moderately shallow black muck.

Source: U.S. Department of Agriculture-Soil Conservation Service & the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin (data compiled 1997)

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



The soil is less than 18 inches deep in 22% of Door County. Another 17% of the county has a soil depth of only 18-36 inches.



TRUE STORIES: Examples of groundwater contamination in Door County

A deep private well was cased to a depth of 250 feet, exceeding Door County well standards, but continued to be contaminated with E.coli.

Groundwater lesson: If land use does not change and bedrock fractures connect, a well may continue to be contaminated no matter how deep it is drilled and cased. The way to avoid contaminated water is to identify and stop the contamination source.

There are homes in Door County where the well water turns brown from manure each spring.

Groundwater lesson: If manure is spread near bedrock fractures, sink-holes or improperly abandoned wells, there is a risk of the manure polluting the groundwater. Be aware of karst features in and near your property so that you can avoid spreading manure, fertilizers and herbicides near them. Avoid spreading manure on frozen or snow-covered ground.

Well water turned gray and smelled like sulfur and smoke after a nearby house burned.

Groundwater lesson: Influxes of water falling on the land, like rainwater, snowmelt, or water used to extinguish fires, can flush through Door County's shallow soil and fractured bedrock and carry contaminants to groundwater. If something out of the ordinary happens near your home, such as fire or heavy rains, be watchful for changes in your well water.

A pond in rural Door County was treated with a blue-tinted algae control. A neighbor's well water soon turned blue.

Groundwater lesson: Surface water can travel through bedrock fractures and carry pollutants to groundwater. Minimize your use of herbicides, fertilizers and other chemicals that can be carried by water. Be aware of potential impacts to your own water as well as your neighbors'.

Examples of groundwater pathogens and pollutants

Depending on the pollution source, contaminated groundwater may have bacteria, viruses, pharmaceutical waste, heavy metals, cleaning solutions or other chemicals that make the water unsafe. Resulting illnesses may be short-lived and not serious, while others may be long-term or life-threatening. The chart below includes some of the most common pathogens and pollutants found when drinking water is contaminated. It is not an all-inclusive list.

Contaminants	Sources	Symptoms
BACTERIA		
<i>Escherichia coliform (E. coli)</i> <i>Salmonella</i> <i>Campylobacter</i> <i>E. coli</i> 0157 (Requires a special water test for detection. Causes similar, but more serious illness than other E.coli strains. Requires medical treatment.)	- Infected human and animal feces - Manure - Septic systems - Sewage	- Gastrointestinal illness - Low-grade fever - Begins 12 hrs - 7 days after exposure
<i>Leptosporidia</i>	- Urine of livestock, dogs and wildlife - Manure	- High fever, severe headache and red eyes - Gastrointestinal illness - Begins 2-28 days after exposure
MICROSCOPIC PARASITES		
<i>Cryptosporidia</i> <i>Giardia</i>	- Infected human and animal feces - Manure - Septic systems - Sewage	- Gastrointestinal illness - Begins 2-14 days after exposure
VIRUSES		
Norovirus	- Infected human feces and vomit - Septic systems - Sewage	- Gastrointestinal illness - Low-grade fever & headache - Begins 12-48 hrs after exposure
CHEMICALS		
Nitrate	- Fertilizers - Manure - Bio-solids - Septic systems	Methemoglobinemia or "Blue Baby Syndrome" – No documented cases in Door County, but elevated nitrate levels in well water may indicate risk of contamination by additional pathogens.
Atrazine (trade-name herbicide for control of broadleaf and grassy weeds)	Estimated to be most heavily used herbicide in the U.S. in 1987/89, with its most extensive use for corn and soybeans in the Midwest, including WI. In 1993, it became a restricted-use herbicide nationally. U.S. EPA set a max. contaminant level (MCL) at 3 parts per billion for safe drinking water.	Short-term exposure above the MCL may cause: congestion of heart, lungs and kidneys; low blood pressure; muscle spasms; weight loss; damage to adrenal glands. Long-term exposure above MCL may cause: weight loss, cardiovascular damage, retinal and some muscle degeneration; cancer.

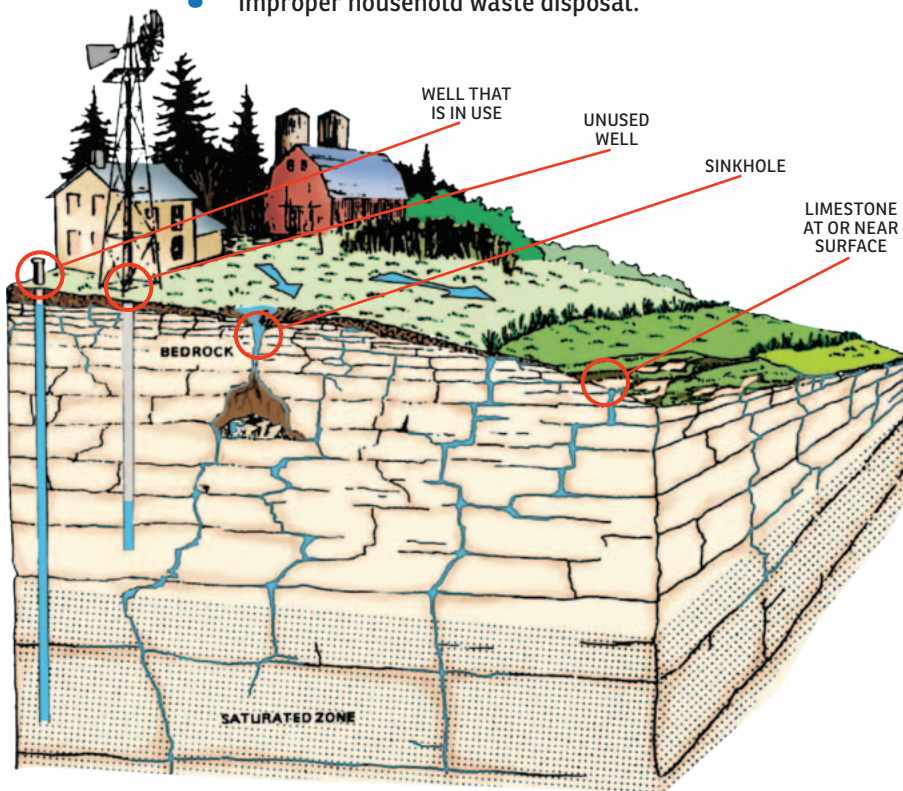
Information Sources: United States Department of Health and Human Services – Centers for Disease Control and Prevention (www.cdc.gov) and United States Environmental Protection Agency (www.epa.gov)

Tips to keep your water clean

Know the threats: Minimize your risks

If you are aware of the threats, you can take action to reduce the risks of contaminating your water and that of your neighbors. Water resources can be threatened by:

- Barnyards and other areas where manure accumulates.
- Cropland and lawns where fertilizers, chemicals or manure are applied.
- Malfunctioning septic systems.
- Rainwater or snowmelt runoff from roads and other paved areas.
- Improper household waste disposal.



Karst regions have bedrock with connecting cracks and layers between rocks that easily transport water and pollutants to the groundwater.

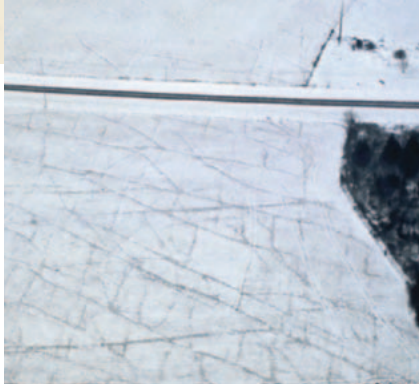
Test your well water

As a homeowner with a private well, it is your responsibility to have your water tested regularly and to know it is safe to drink. ***It is recommended that all private wells be tested at least once per year for coliform bacteria and more often if changes in water taste, odor or color are noticed.*** Door County well owners may benefit from more frequent testing to detect seasonal or weather-related trends. There may be additional tests wise for you to conduct, based on activities around you, or if bacteria levels indicate that your well is vulnerable to contamination.

ADDITIONAL WELL WATER TESTS TO CONSIDER

Contaminant	Which wells or homes should be tested?	How often should I test?
Nitrate	- All newly constructed well or wells with no previous test history. - Wells within ¼ mile of fertilized fields or animal feed lots and wells that had levels close to 10 ppm. - Wells used by pregnant women or infants.	- Two tests spaced 6 months apart. - Test annually. - Test before pregnancy and at time of birth.
Pesticides	Well is within ¼ mile of agricultural fields, or pesticide manufacturing, storage or mixing facilities.	Once every 5-10 years.
VOCs (solvents, gasoline, fuel oil)	Wells within ¼ mile of a landfill, underground fuel or gasoline tank and wells within ¼ mile of where solvents have been used (drycleaner, automotive garage, body shop, etc.).	Test once every 5-10 years or when solvent or gasoline taste or odor is noticed.
PCBs	Water with an oily sheen or petroleum odor, and submersible pump installed before 1979.	Test once if needed.
Arsenic	Every well, especially those near former or current orchard sites.	- Test once. - Test annually if arsenic is present. - Re-test if iron levels increase or if water changes in taste or odor.
Lead	- Wells near cherry orchards. - Homes with copper plumbing installed before 1985 or with brass fixtures; and naturally-soft water.	Consider one-time test.
Copper	Water used to prepare infant formula or if any resident in home experiences repeated symptoms of nausea, diarrhea or abdominal cramps. Homes most at risk have new copper plumbing or naturally-soft water.	- Homes with new copper plumbing should be re-tested in 6 months. - Test before and after flushing the faucet for 2-3 minutes.

Source: WDNR publication, Tests for Drinking Water from Private Wells. PUBL-DG-023 2007



This winter aerial view makes bedrock cracks obvious. In places like this, extra care is needed to prevent surface pollution from entering groundwater.



Report observations of water suddenly disappearing in a road ditch to the township or county road department. This may indicate a new sinkhole.

Minimize risks of groundwater contamination

ON YOUR FARM

- 💧 Develop and follow a nutrient management plan for your land to optimize yields without using more fertilizer than needed. Inquire at the Door County SWCD for assistance and cost-sharing opportunities.
- 💧 Do not apply manure, fertilizers, pesticides or other agricultural chemicals near wells, sinkholes, fractures or ditches.
- 💧 Do not apply manure during frozen or snow-covered conditions.
- 💧 Incorporate manure into the soil immediately upon application.
- 💧 Properly fill and seal unused and abandoned wells (must be done by licensed pump installers or well drillers). Information can be obtained from the Wisconsin DNR or Door County SWCD. Certain wells may be eligible for cost-sharing through the SWCD.

Wisconsin DNR Spill Hotline: (24 hours/day)

1-800-943-0003

Report fuel, manure, pesticide, and other hazardous and solid waste spills immediately! Your call will activate professional response and clean-up crews.

(continued on pg. 12)



Abandoned wells may still have visible structures such as windmills and hand pumps, while others may be almost hidden because structures have been removed. However, they all pose direct threats to groundwater if not properly filled and sealed.



Old well casings should be properly sealed with bentonite (above). Contact the Door County Soil and Water Conservation Department for information about licensed professionals who fill and seal wells.





Runoff from surrounding land may temporarily collect at a sinkhole if the hole is blocked by fieldstone, roots or soil.



Runoff from 300 acres flowed into this large sinkhole and drained to groundwater. The sinkhole was capped with soil, and a pipe was installed to divert the runoff.

Minimize risks of groundwater contamination

ON YOUR FARM (continued)

- Build berms, contours, grass buffers or grassed waterways to divert water away from sinkholes, fractures and ditches. Inquire at the Door County SWCD or NRCS for information and cost-sharing opportunities.
- Properly stabilize sinkholes. It may be possible to continue farming over a properly stabilized sinkhole. Inquire at the Door County SWCD for information and cost-sharing opportunities.
- Do not dispose of chemical containers, dead animals, or any trash in sinkholes, in areas with shallow soil, or nearby streams or lakes.



Cracks and sinkholes in fields quickly route polluted runoff down to the groundwater.



Sinkholes must not be used as dumps. This poses a serious contamination threat.

Protect the water you drink – *Keep it clean*



Yards may need to be re-worked to divert runoff from sinkholes, fractures or old wells. Here a man-made pond collected polluted runoff from the surrounding fields, yard and road ditch, but never held water for long. It drained through a bedrock fracture, repeatedly contaminating groundwater. The pond had to be filled-in and the yard graded to stop the contamination.

IN YOUR HOME & YARD

- Build berms or grade your yard to direct water away from sinkholes, fractures and wells. Sinkholes can be filled and sealed by a professional if the circumstances permit.
- Do not apply fertilizer or pesticides near sinkholes, fractures or wells in your yard.
- Minimize use of lawn chemicals and fertilizers to save money AND protect the environment, since most lawns do not need very much fertilizer to stay healthy and green.



Minimize use of fertilizers and pesticides.



A soil testing kit.

- Test your lawn's soil to avoid over-applying fertilizer. Soil testing is available through Door County UW-Extension or private firms.

(continued on next page)



A downspout and swale control the direction of roof runoff.



A new septic system replaces one that was malfunctioning.

Minimize risks of groundwater contamination IN YOUR HOME AND YARD (continued)

- Direct downspouts to your lawn, rain garden or rain barrel, away from pavement.
- Have your septic system inspected and pumped every three years by a certified septic installer to be sure it functions properly.
- Properly dispose of household and hazardous waste (paint, drained oil, old fertilizers, herbicides, cleaning solutions, etc.) at collection sites and events. Watch for annual "Clean-Sweep" announcements.



A rain barrel is a low-cost way to reduce runoff from the roof.



- Test your well water each year. Water test kits are available from the Door County Sanitarian's Department. See page 9 for details.

Collection site for household and hazardous waste.

Who can help?

AGENCY & CONTACT INFORMATION	TYPE OF ASSISTANCE
Door County Soil and Water Conservation Dept. (SWCD) (920) 746-2214 http://map.co.door.wi.us/swcd	Information, technical assistance and cost-sharing opportunities for: - Diverting water from sinkholes, fractures, wells and ditches - Properly filling and sealing unused wells - Nutrient management planning - Stabilizing sinkholes - Stormwater management at the home (yard grading, rain gardens, etc.)
Wisconsin Department of Natural Resources (DNR) Service Desk (888) 936-7463 "What's Wrong with My Water?" online: http://dnr.wi.gov/org/water/dwg/private/waterproblems.htm	Information and publications on: - Licensed professionals to fill and seal unused wells - Drinking water tests - Drinking water contaminants - Private wells
Door County Sanitarian's Department (920) 746-2308 www.co.door.wi.gov	- Septic system information - Private well water test kits
Door County Public Health Dept. (920) 746-2234 www.co.door.wi.gov	- Guidance on water usage when well water is unsafe - Well water tests
USDA Natural Resources Conservation Service (NRCS) (920) 845-1360 www.wi.nrcs.usda.gov	Technical assistance and cost-sharing opportunities for nutrient management, manure storage, water diversions and other conservation practices on agricultural lands.
Door County UW-Extension Office (920) 746-2260 www.uwex.edu/ces/cty/door	Information and publications for: - Soil analysis - Environmentally-conscious yard care and agricultural practices - Rain gardens - Groundwater
Wisconsin Department of Commerce Door County contact (608) 267-1401 http://commerce.wi.gov/php/sb-ppalopp/contam_alpha_list.php	Information on approved drinking water treatment devices.

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