



Protecting Groundwater Supplies



2005

Actions That Degrade Groundwater Quality

1. Over-development
2. Impervious cover
3. Improper septic and wastewater discharges
4. Stormwater runoff
5. Drought conditions

Actions That Protect Groundwater Quality

1. Minimize disturbances of wetlands, forests, meadows, and farmlands.
2. Maximize stormwater infiltration.
3. Reduce pollution from industries, agriculture, and transit.
4. Encourage the protection of well head areas.
5. Preserve open space.

Groundwater Functions in a Watershed

A watershed is an area of land that drains to a main body of water, and it includes both the waterway and the land that drains to it. The land, surface water and groundwater resources of a watershed are interconnected. Groundwater performs an integral function in a watershed because it can naturally discharge to the surface as a spring to replenish wetlands, and provide the base flow that feeds streams and lakes.

Satisfying our water needs is another vital function of groundwater. Approximately 50% of the drinking water needs for New Jersey residents are met by groundwater, and wells also supply water for irrigation and industrial uses. But this important resource is being strained and impaired by development and growing population demands. The activities that we perform on land can have significant consequences on our water resources. This guide will help explain these connections and strategies to minimize the possible risks of degradation.

While federal and state regulations are established to protect groundwater, local initiatives can also be implemented to safeguard regional groundwater supplies. An important first step in this process is a greater understanding of groundwater and our regional supplies.

The Groundwater Cycle:

The water that flows from your faucet may come from a groundwater well, a surface water reservoir or river, and could be from a private or public water system. But all our fresh water supplies originate from and are replenished by rain or snow. New Jersey generally receives 47 inches of precipitation a year.

Much of this water runs off the land to our streams, some is absorbed by plants, or is recycled to the air through evapo-transpiration. Only a few inches a year are able to infiltrate the soil and seep down to replenish our groundwater supplies.

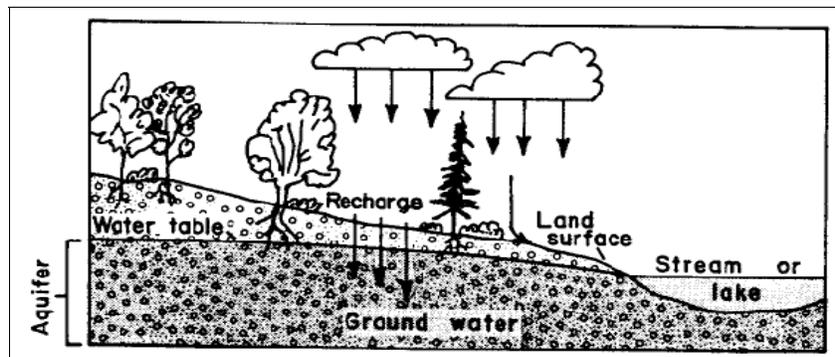


Image from www.water.usgs.gov



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This guide provides an informational overview of federal and New Jersey policies and regulations, but is not comprehensive. For more detailed information please refer to the listed resources and websites on the back page.

Hydrogeology Basics

Groundwater Basics

Groundwater is replenished *only* when precipitation is able to infiltrate the soil and seep down to subsurface storage areas called *aquifers*. This is also known as aquifer recharge. Groundwater is stored in the pores and spaces between soil grains or in rock fractures (cracks) or the *saturated zone*. The top of this saturated zone is called the *water table*, which can fluctuate based on seasonal conditions.

Approximately 88% of New Jersey's population rely on *606 public water systems*, which are served by surface or groundwater supplies. The NJDEP regulates *2,237 public wells* and *64 surface water sources* that serve 8 million residents, and over 93% comply with the NJ Water Quality Standards. The remaining 12% of NJ residents (nearly 1 million) rely on private residential wells.

Aquifer recharge and infiltration rates are substantially affected by site specific characteristics including soil, geology, topography, and land uses. Steep slopes that increase water runoff, tight clay soils, hard unfractured bedrock, and impervious asphalt cover are factors that reduce infiltration. Certain areas are *naturally* more capable of transmitting, recharging and storing groundwater supplies.

NJDEP has identified groundwater **aquifers** throughout the state and uses a ranking system from A to E, which identifies high-capacity water supply wells (500 gallons per minute) to low capacity wells (25 gpm). The high-capacity recharge areas located in the center of the state provide significant regional water supplies, and are critical to protect.

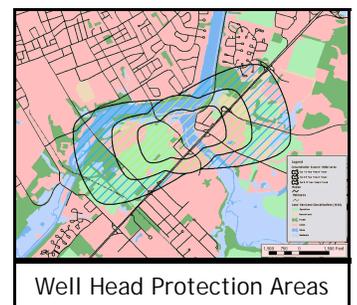
Regional Geology and Groundwater Resources

The Millstone Watershed is underlain by two distinct types of **geology**, which strongly influence groundwater resources. The boundary between the two, known as the **Fall Line**, generally follows U.S. Route 1. To the southeast of the Fall Line is the **Coastal Plain Province**, which is characterized by thick deposits of unconsolidated sandy sediments, interspersed with clay layers. To the northwest of the Fall Line lies the **Piedmont Province**, characterized by fractured bedrock of various compositions. The Piedmont area includes the red Brunswick shale, Stockton sandstone, and the diabase of the Sourland mountains. Much of the Piedmont region aquifers are categorized by moderate capacity wells (100 to 250 gpm), but the Sourland Mountain region can only sustain low capacity wells. The Coastal Plain Province contains certain areas with high-capacity wells, and critical recharge areas that are important to our watershed, and many southern communities.



Maps of local geology, aquifers, and groundwater recharge areas can be easily reviewed on the NJDEP website, i-MapNJ page www.state.nj.us/dep/gis/imapnj.

Well Head Protection Areas (WHPA) The NJ Geological Survey (NJGS) also created maps that identify each public well and delineate *Groundwater Tiers* or areas around the wells, called Well Head Protection Areas (WHPA). For example, groundwater within Tier 1 can flow to the well within a two-year timeframe. Groundwater in Tier 2 and 3 can reach the well within five and twelve years. Delineating these well head protection areas can help safeguard these water supplies by addressing potential groundwater pollution before the public wells are affected. Visit the NJGS and i-map NJ website to review data for your community wells. www.njgeology.org/index.html.



Groundwater Protection Strategies

Maintaining good water supplies is vital for human health and the environment, and economically important for our homes, communities, schools, farms, manufacturing and service industries.

Impairments to our Groundwater Resources

The primary threats to water resources in the region are pollution, overuse, and reduction in groundwater recharge. Human activities and land uses can introduce pollutants, and impervious surfaces (pavement, rooftops) can reduce groundwater recharge.

- **Point sources of pollution** that threaten groundwater include pollutants from underground storage tanks (USTs) that may contain septic sludge, heating oil, or gasoline; and discharges from commercial and industrial sites and landfills, as well as thousands of known contaminated sites, which involve groundwater contamination. www.state.nj.us/dep/srp/
- **Nonpoint source pollution (NPS)** can pollute groundwater sources but may not have a distinct discharge point, and can be generated from failing septic systems, solvents formerly used to clean septic systems, runoff from our farms, lawns, parking lots, and roads that may be contaminated with road salts, fertilizers, pesticides, metals, oils, etc.

Municipal Opportunities for Action

While forests, meadows and farmlands allow rain to infiltrate and replenish groundwater supplies, the development of buildings, roads and parking lots causes more runoff to occur, decreases groundwater recharge, potentially reduces water quality by introducing pollutants, and increases demand for these diminished resources. Throughout NJ we lose 50 acres a day to development, and some planning groups predict that central NJ will be fully developed by 2025.

Important strategies to protect water supplies include appropriate Land Use Planning, Watershed Management, Farmland and Open Space Preservation, and implementing best management practices that minimize negative impacts to water resources.

- **Incorporate information** on geology, groundwater resources, and critical recharge areas into local planning documents, such as a community Master Plan, Conservation Plan, and Open Space Plan.
- **Support land preservation** of woodlands and farmlands and target acquisitions or conservation easements to protect critical groundwater recharge areas.
- **Perform nitrate dilution modeling** to help establish appropriate septic densities and lot sizes.
- **Support zoning ordinances that addresses** compatible land uses, low-density development, stream corridor protection, and ordinances that encourage practices for stormwater infiltration, minimize site disturbances, and address waste collection programs
- **Adopt a Well Head Protection Ordinance** that limits certain land uses and exposure to pollution sources, such as gasoline stations, from critical aquifer recharge areas. Contact Stony Brook to review our Model Ordinance Package www.thewatershed.org/wm_resources.php.
- **Create an inventory** of potential pollution sources locally and problem wells to ensure appropriate corrective action is implemented.
- **Sponsor public education** and workshops for well owners. Invite public health and ground water professionals as speakers, and distribute information on household chemical products, maintenance of septic system and wells, and well testing.
- For more ideas, view our Municipal Assessment Program www.thewatershed.org/wm_supporting_muni.php



Groundwater Programs in New Jersey 2005

Various laws, regulations and programs at the federal and state level protect our groundwater. NJDEP is authorized to protect the waters of the state through laws and regulatory authority that address issues such as Water Supply Management, Water Quality Planning, and Water Pollution Control. By learning about these requirements and policies, you can better understand how your local waters are being protected.

Clean Water Act (CWA) of 1972—33 U.S.C. Chapter 26

The federal Clean Water Act (CWA) was enacted in 1972 to protect our nation's water resources and provide citizens with "reliable and accurate" information about their water. It has become a foundation for many federal and state laws and regulations that have protected water resources for 30 years. For more information, order the "*The Clean Water Act: An Owner's Manual*" at www.rivernetwork.org/marketplace or view the text at www.epa.gov/water/laws.html



Are NJ Groundwater Supplies Clean and Plentiful?

A great place to start looking for these answers is the NJDEP Water Supply Administration website, which contains various NJDEP reports on their efforts to address the issues outlined below:

www.state.nj.us/dep/watersupply/index.html

- To ensure that drinking water supply systems meet the Federal and New Jersey Safe Drinking Water Standards.
- To manage and protect the surface and ground water sources and the environment from: diversions that exceed sustainable yields through the water allocation permitting process; improper well drilling activities; and drought emergencies.
- To ensure the proper finance, construction, operation and management of drinking water supply systems and infrastructure needs, and
- To help evaluate and plan for water supply needs and promote smart growth and sustainability of water resources.

Source Water Assessment Programs (SWAPs)—P.L. 104-182

In 1996, all states were required to establish a Source Water Assessment Program (SWAP) for all public water systems. The Assessment Program evaluates existing and potential sources of pollution, determines vulnerability to contamination, and delineates water protection areas. The Assessment Program lists the recent compliance records for each community public water supply system. Visit the website to review data for your community www.state.nj.us/dep/swap.

NJ Safe Drinking Water Standards—N.J.S.A. 59:12A

Primary drinking water standards are set to protect drinking water from specific contaminants that can affect public health, and they are identified as Maximum Contaminant Levels (MCLs). Secondary standards are established for aesthetic quality such as color, odor, sulfates, iron and taste, and these features are also important to address. The NJDEP website lists the current standards and recent compliance records for public water supplies. www.state.nj.us/dep/watersupply/standard.htm

Recently, the NJDEP has identified concerns with naturally occurring *radionuclides/radon and arsenic* in public and private wells in our watershed. NJDEP offers homeowner guides that discuss the health risks, testing, and treatment options and costs. The guides can be reviewed at www.state.nj.us/dep/dsr/arsenic/guide.htm and www.state.nj.us/dep/rpp/radwater.htm.

Protecting Groundwater Supplies

Private Well Testing Act

The Private Well Testing Act was adopted by NJ in 2002 to ensure that private wells are tested before a home is sold or rented. Before closing, both the buyer and seller must certify the well test results, and if contamination problems are identified the parties then negotiate an agreement for the necessary actions. Well water must be tested for total coliform, nitrates, iron, manganese, pH, lead and volatile organic chemicals (VOCs), and these certified laboratory results could cost about \$600. Testing for arsenic, mercury and gross alpha particle activity, including radium, is also required for certain areas in our watershed region.

Visit the NJDEP website to review the law requirements, information on potential health risks, and possible remedies to improve water quality. www.state.nj.us/dep/pwta/

Compliance and Enforcement For Groundwater Permits

New Jersey Pollution Discharge Elimination System (NJPDES) Program (N.J.S.A. 58:10A-1) oversees discharges to our waterways and groundwater resources from varied operations such as underground storage tanks (USTs), quarries, manufacturing sites, corporate offices, sewage treatment plants, and sanitary systems.



Each permit incorporates a specific Groundwater Protection Plan (GWPP N.J.A.C. 7:9-6) that includes the following components: a ground water monitoring well network; a sampling and reporting schedule; a discharge monitoring program; and best management practices and preventative measures. www.state.nj.us/dep/dwg/groundw.htm

These NJPDES permits are renewed every five years and the public can provide comments and concerns. To review permit information, visit the NJDEP searchable database of enforcement reports online at: www.nj.gov/dep/enforcement/reports-list.html.

Contaminated Sites

The NJDEP has identified approximately 12,000 known contaminated sites in New Jersey, and 60% involve ground water contamination. Some groundwater areas have become so polluted that the state designates these zones as *Groundwater Classification Exemption Areas* (N.J.A.C. 7:9C-1.6). The NJDEP requires the responsible parties to perform groundwater cleanups if it is feasible; notify local Health Departments; and file *deed restrictions* with the County. Information on these sites can be viewed at Site Remediation and Waste Management website www.state.nj.us/dep/srp/ and the List of Known Contaminated Sites for each county is posted at www.state.nj.us/dep/srp/kcs-nj/kcs-nj.htm

Additional Groundwater Protection Programs

- **The Septic Rule** requires the NJDEP review of new developments that include 50 or more homes that would rely upon septic systems. The NJDEP requires nitrate dilution modeling and groundwater evaluations to ensure that groundwater resources will not be degraded.
- **The NJDEP Green Acres program** prioritizes its funding and land acquisitions to target lands that protect surface water and groundwater resources.
- **Stormwater Rules (NJAC 7:14A and 7:8)** adopted in February 2004, recognize the importance in protecting groundwater supplies and require new construction to maintain infiltration to groundwater at pre-development conditions, and reduce stormwater runoff.



Your Role To Protect Groundwater



Household Practices:

Everyone can act in small ways to protect and conserve groundwater resources, and below are some easy ideas to implement:

- Conserve water by taking short showers; shut water off while brushing teeth; and run full loads of dishes and laundry.
- Repair leaky faucets.
- Use alternative cleaning products that are less harmful to the environment.
- Dispose of chemicals properly, and use the local recycling center instead of dumping waste down the sink.
- Inspect and maintain oil heating tanks to prevent subsurface leakage.
- Limit fertilizer and pesticide use on plants and lawns.
- Maintain your septic system with an inspection and waste clean out every 3 years.
- Inspect and test your well annually.
- For more ideas, view our River Friendly Programs
www.thewatershed.org/river_friendly_program.php

Annual well testing is not required, but the data may be priceless for your family!

Assistance For Groundwater Questions

Groundwater questions can often be addressed by your local Department of Health (DOH). Your local health officer can often:

- Provide records and details about *the construction of your own septic system or well*, including: its depth, water levels, and the geological formations.
- Provide general information on geology, pumping rates, ground water recharge areas, and local ground water quality.
- Review well testing regulations and identify local certified laboratories.

Interesting Groundwater Facts

According to the US Geological Survey, nationally groundwater supplies:

- **37%** of agricultural use (mostly for irrigation)
- **37%** of the public water supply withdrawals
- **51%** of all drinking water for the total population
- **99%** of drinking water for rural populations

GROUNDWATER RESOURCES

Stony Brook-Millstone
Watershed Association
www.thewatershed.org

Clean Water Network
www.cwn.org/cwn/

Environmental Protection
Agency
www.epa.gov/safewater/
www.epa.gov/ebtpages/wategroundwater.html

Groundwater Consortium
www.qwconsortium.org

Groundwater Foundation
www.groundwater.org/

NJDEP Geological Resources
www.state.nj.us/dep/gis/newmapping.htm

NJDEP Hydrologic Conditions
www.nj.gov/dep/watersupply/precip.htm

NJ Geological Survey
www.njgeology.org/functions/index.htm

NJ Water Supply Authority
Raritan River Basin Watershed
Management Project
www.raritanbasin.org/

US Geological Survey
<http://water.usgs.gov/>
<http://nj.usgs.gov/>
<http://water.usgs.gov/pubs/wdr/WDR-NJ-03-2/>

Working on Watersheds
www.rci.rutgers.edu/~cecomm/