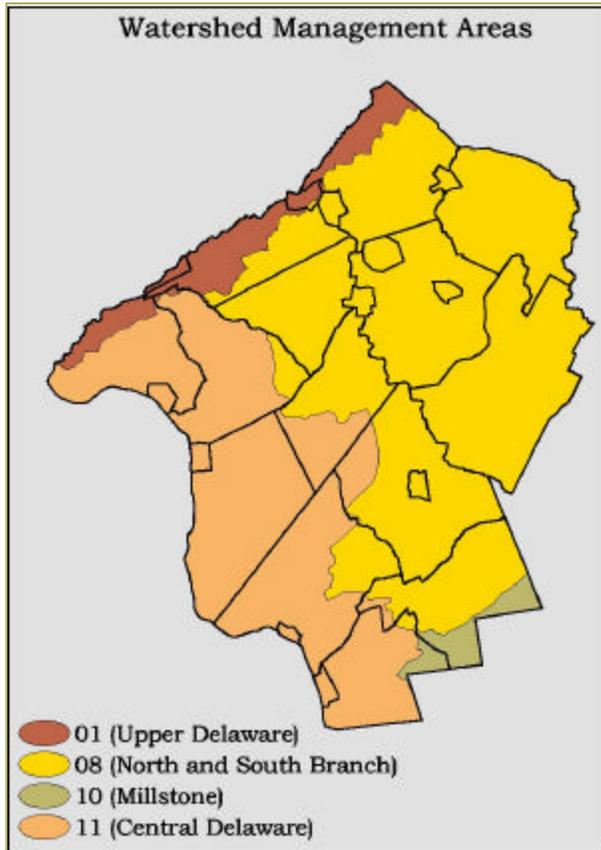


County Profile—Natural Resources



Map 9. Watershed Management Areas, Hunterdon County, NJ.

Primary data source: NJDEP.

The Delaware River is governed by a separate series of use designations and water quality criteria established by the Delaware River Basin Commission (DRBC). The DRBC is an interstate agency overseeing planning, regulation and water quality protection of the Delaware River. The portion of the Delaware River extending along Hunterdon County is in a water quality classification called Zone 1E. Here, effluent discharges are permitted into the river. However, they must meet specific effluent quality requirements so that water is maintained in a safe and satisfactory condition for a variety of uses.

The New Jersey DEP monitors water quality at select stations along numerous streams across the State. Results are used to help identify those streams that fail to meet standards, for which pollutant loadings must be addressed. In addition to the NJDEP monitoring program, various watershed associations and local environmental commissions also conduct water quality monitoring. Municipalities can use results of sampling for local planning purposes. Detailed land use assessments and inventories in proximity to monitoring stations can help define possible causes of water quality impairment.

National Wild and Scenic River Program

In November 2000, a 67-mile segment of the Delaware River, extending from a point just below the Delaware Water Gap to Washington Crossing in Pennsylvania and New Jersey became a National Wild and Scenic River. Also included were three tributaries in Pennsylvania. This section of the Delaware River is called the “Lower Delaware National Wild and Scenic River” to distinguish it from the previously designated Upper Delaware, beginning in Hancock, New York, flowing down to the Delaware Water Gap. In addition, public interest in pursuing Wild and Scenic River designation for the Musconetcong River launched a separate planning process to assess the River for possible inclusion in the National Wild and Scenic River Program. Similar efforts are underway on behalf of the Wickecheoke and Lockatong Creeks as well.

Hunterdon County. Today, our rivers and streams function as potable and industrial water supplies, recreational amenities and habitats. In one way or another, all of these functions depend on adequate water supply and quality.

Surface Water Quality

New Jersey’s Surface Water Quality Standards set water quality criteria for protecting surface waters. These standards also establish designated uses to be supported by various water bodies.

New Jersey’s anti-degradation policies help to determine whether and to what extent water quality may be lowered. Policies apply to all surface waters in New Jersey and recognize several classifications of waters (Map 10). Outstanding National Resource Waters and FW1 Waters reflect the highest anti-degradation level of all classifications, followed by Category One and then Category Two Waters. All waterways in Hunterdon County are either Category One or Category Two waters. Approximately 28% (248 miles) of Hunterdon County stream miles are Category One waters. The rest are Category Two waters. Waters are further classified as trout production, trout maintenance or nontrout. Trout is used as a parameter because it is an indication of relative water quality. Over half of our mapped streams (465 miles or 58%) are trout streams.

County Profile—Natural Resources

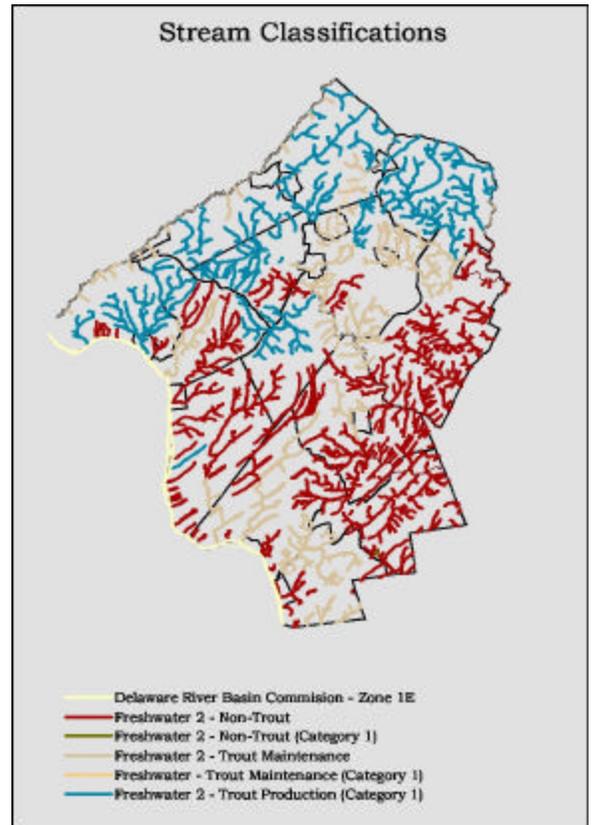
The National Wild and Scenic Rivers Program, initiated in 1968, grants protection of qualified rivers through combined public actions and voluntary private initiatives. Designated river corridors receive permanent protection from federally-licensed or assisted dams, diversions, channelizations and other water resource-based projects that the federal government determines to have direct, adverse impacts on the river. Designated river corridors extend .25 miles on either side of the river.

Designation does not affect current zoning and land use regulations locally, nor does it require riverfront property owners to permit public access. However, a Wild and Scenic Rivers management plan, prepared for the recently-designated section of the Delaware River, makes a variety of recommendations, including land use planning recommendations, for enhancing and protecting water quality, as well as natural, scenic, historic, and recreational resources associated with the river. Municipalities are encouraged to review their own current land use goals and strategies, and pursue those goals and actions that would enhance ongoing local efforts. The Delaware River Greenway Partnership, with National Park Service support, recently organized a management plan committee and citizens advisory committees. They provide ongoing public education about the benefits of Wild and Scenic River designation and assist municipalities in implementing Management Plan recommendations.

Sections of the Lower Delaware River did not receive designation for a variety of reasons. For instance, areas that were too developed to qualify or areas that did not demonstrate public support were excluded. However, within three years of the official designation, municipalities may pursue expansion of the eligible area to include those missing links, if formal interest is conveyed to the National Park System.

Flood Plains

When streams fill with excess volumes of water, beyond that which the channel itself can contain, the water overflows onto the adjoining flat lands. It is this adjoining area that is known as the flood plain. Flood plains can be viewed in several ways (Maps 11 and 12). One way is through mapping flood plain soils. Flood plain soils are deposited alongside streams and rivers from upland areas. Some headwater streams and other stream segments actually lack flood plain soils. These streams are usually located in very steep terrain with limited, if any, adjacent valleys. Such waterways were constructed from underlying geology—“parent material” - rather than depositional materials that characterize flood plain soils.



Map 10. Surface Water Quality Classifications, Hunterdon County, NJ.

Primary data source: NJDEP.

FW1—Freshwater 1

FW2—Freshwater 2

TP—Trout Production

TM—Trout Maintenance

NT—Non-Trout

C1—Category 1

DRBC—Delaware River Basin Commission

Photo. Damage caused by Hurricane Floyd in ____ Tp.

County Profile—Natural Resources

The Federal Emergency Management Agency (FEMA) prepares flood plain maps for municipalities through the National Flood Insurance Program. FEMA uses the 100-year flood as the base flood to implement its flood plain management program. The 100-year flood is the flood event that statistically occurs once every 100 years. The flood plain serves a variety of important functions. Of primary importance is its flood carrying capacity. Since this is the area immediately adjacent to waterways, it provides temporary storage for waters that top the banks of streams and rivers during flood events. Additionally, these natural corridors help to filter out pollutants and are habitats for flora and fauna. Therefore, flood plain management is a necessary and practical tool for protecting these functions. Moreover, flood plain management saves dollars. Floods generate the majority of disaster-related costs in most years, according to FEMA. In the fall of 1999, Hurricane Floyd reeked havoc in much of New Jersey, including Hunterdon County, where damages exceeded \$8 million.

New Jersey implements flood plain controls through the Flood Hazard Area Control Act Rules. These rules, more stringent than federal rules, restrict development in the 100-year flood plain with the primary intent of minimizing property damage and public safety risks. However, limited development and alterations can occur in portions of the flood plain, providing they comply with regulations.

Aside from the Flood Hazard Area Control Act Rules, preventive planning measures at the local level are perhaps the most effective means to protect the multiple values flood plains provide and reduce costs incurred as a result of repairs and reconstruction.

Wetlands

Wetlands are transitional areas between upland areas and aquatic areas where the water table is at or near the surface of the land. For regulatory purposes, certain hydrologic, soil and plant characteristics must be evident to qualify as a wetland. Freshwater wetlands are more commonly referred to as swamps, marshes or flood plains. They also include areas called “vernal pools.” These are isolated ponds that develop only during the wet seasons and remain dry at other times of the year, are unconnected to a flowing stream system, and contain water supplied by surface runoff and/or ground water. Vernal pools provide critical habitat for amphibians and reptiles.

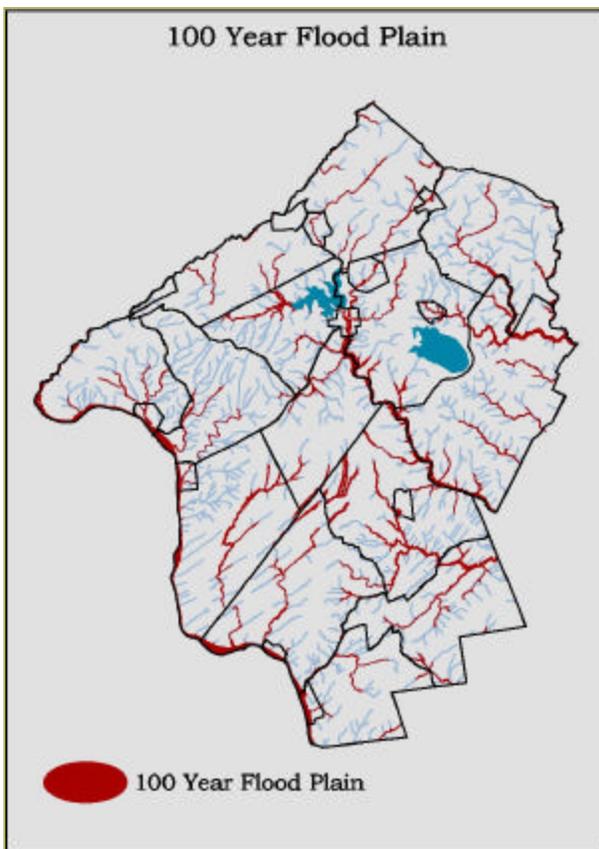
Wetlands serve many important functions that affect both public and ecosystem health. For instance, they mitigate flooding impacts by soaking up runoff from rainstorms and then release flood

County Profile—Natural Resources

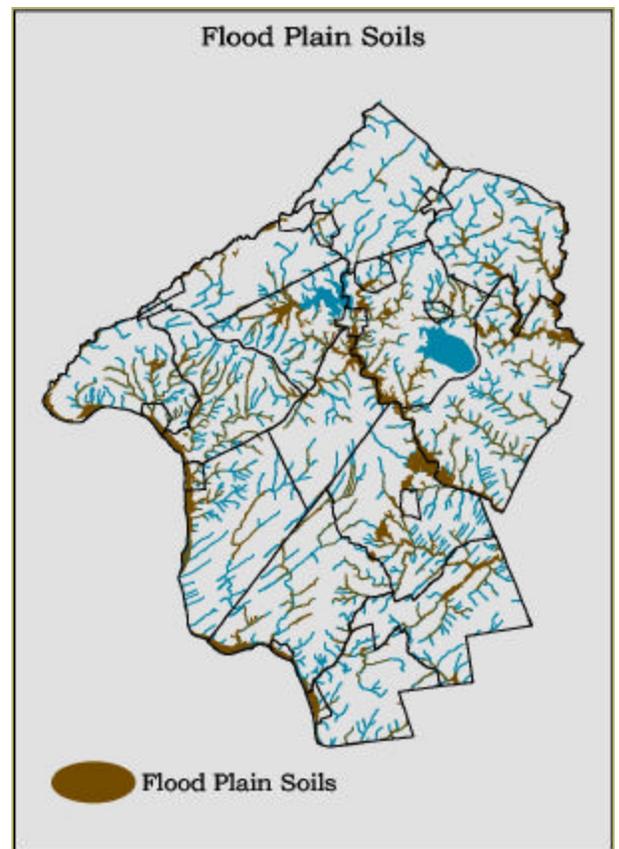
waters during drier periods. By controlling the volume and rate of stormwater runoff, they also reduce the potential for streambank erosion. Wetlands filter out pollutants and sediments from runoff, provide base flow to streams and recharge ground water. They are also considered among the most biologically productive natural ecosystems in the world.

Estimates of the total acreage of freshwater wetlands vary widely in Hunterdon County. In part, this is due to the different methods used to calculate acreage. For instance, the New Jersey DEP includes a category of wetlands called “Agricultural Wetlands” in its maps. The Rutgers University Center for Remote Sensing and Spatial Analysis (CRSSA), however, does not recognize this category as wetlands in its mapping methodology (Map 13). Thus, freshwater wetlands occupy somewhere between 9,800 acres and 25,000 acres or between 3.5% and 9% of the entire land area.

The greatest losses in wetlands occurred prior to enactment of New Jersey’s Freshwater Wetlands Act in 1987. Between 1972 and 1984, Hunterdon County lost approximately 13, 552 acres of wetlands (56% decline) . However, between the mid-1980s and mid-1990s, Hunterdon County is estimated to have only lost between 342 and 871 acres of wetlands. In part, these losses may be due to exemptions of certain land use activities, such as farming and forestry operations, from the regulations.



Map 11. 100 Year Regulatory Flood Plain.
Primary data source: FEMA.

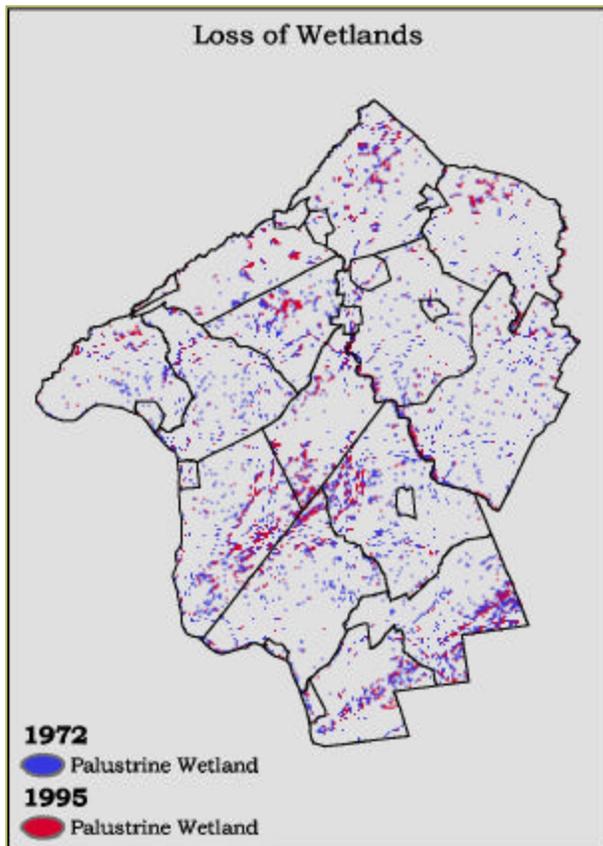


Map 12. Flood Plain Soils.
Primary data source: Natural Resources Conservation Service (NRCS).

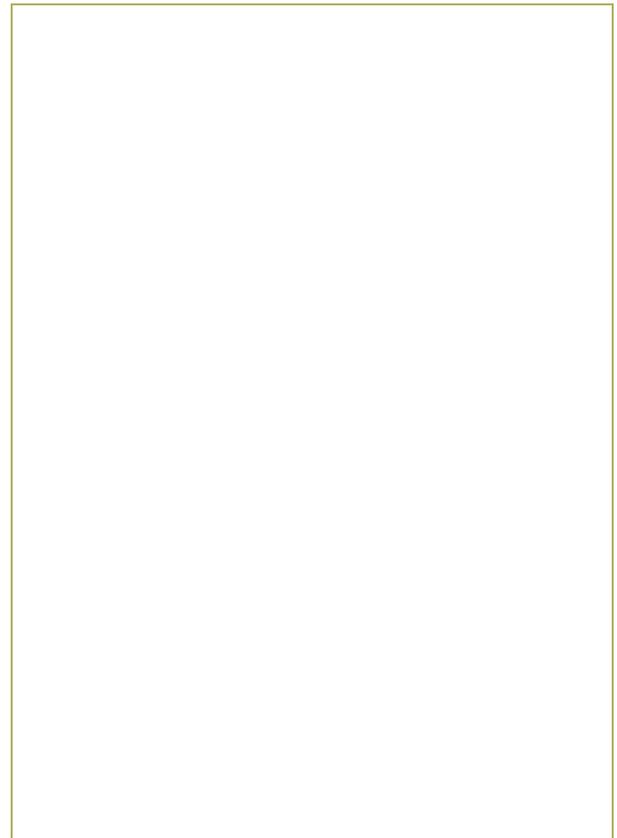
County Profile—Natural Resources

Riparian Corridors

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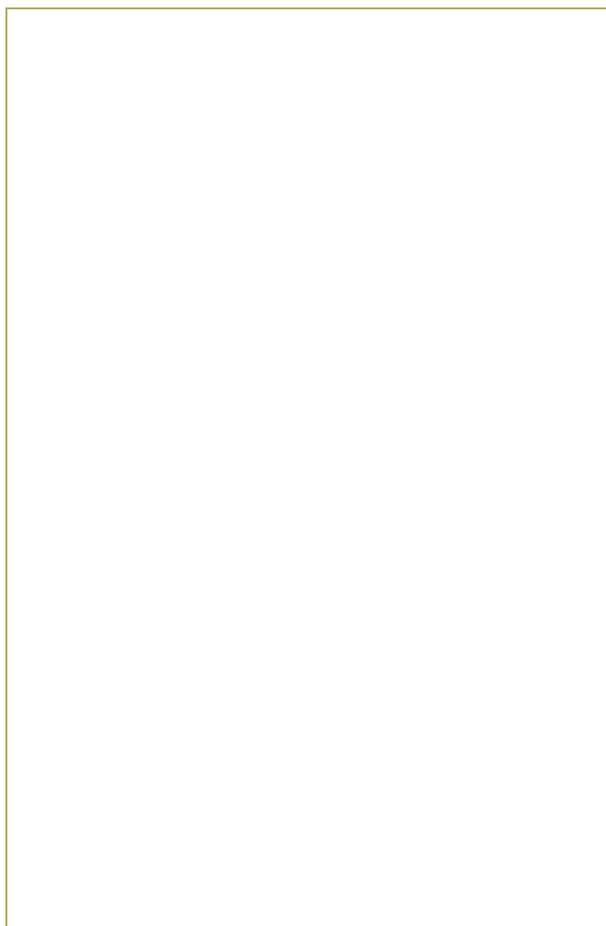


Map 13. Wetland Loss Between 1972 and 1995. Primary data source: Rutgers University CRSSA. Note: Wetlands coverage does not include a category of wetlands called “Modified Agricultural Wetlands” which NJDEP recognizes. Palustrine wetlands are non-tidal, inland wetlands.



Map 14. Riparian Corridors. Primary data sources: Rutgers University CRSSA, NJDEP, FEMA.

County Profile—Natural Resources



Ground Water

Most ground water within Hunterdon County originates from local precipitation. Surface waters provide very little recharge. Conversely, ground water can supply over 70% of all flow to surface water bodies, such as streams and wetlands. Therefore, both quantity and quality of ground water play important roles in ensuring not only adequate drinking water supplies for public and private wells, but also in maintaining a healthy surface water ecosystem.

Aquifer and Ground Water Recharge Areas

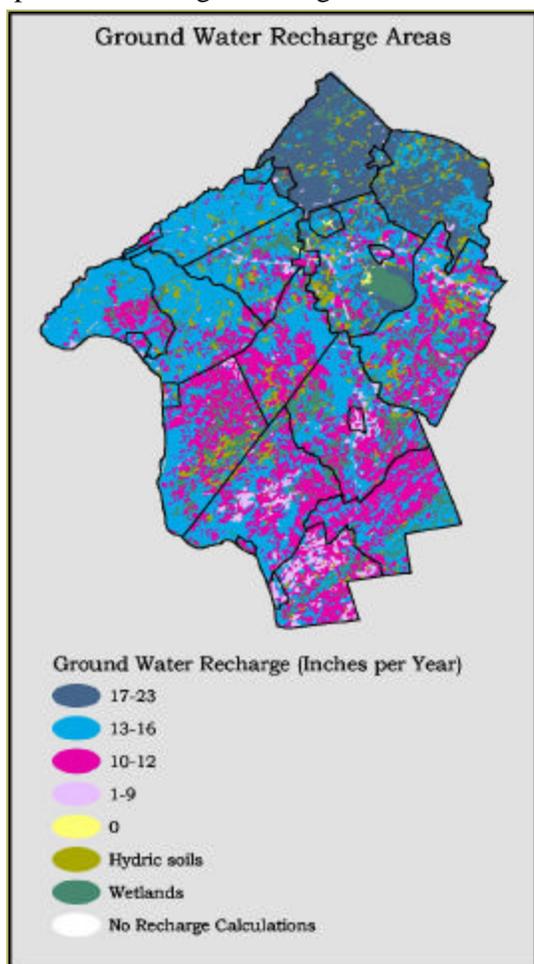
An aquifer is a geologic unit that is capable of supplying useful quantities of water to wells. Aquifer recharge areas are areas on the surface of the land that replenish the underlying aquifer with ground water. Ground water recharge areas are land areas where ground water seeps through the ground into a saturated region below plant roots. The best ground water recharge areas are often overlain by forest cover.

*Map 15. Riparian Corridor Health Assessment.
Primary data sources: Rutgers University CRSSA,
NJDEP, FEMA.*

County Profile—Natural Resources

Some aquifers have better water bearing capacity than others. New Jersey Geological Survey has ranked aquifers throughout the state according to their relative water bearing capabilities. High ranking aquifers are not necessarily aquifer recharge areas. To be a good aquifer recharge area, rainwater must be able to percolate into the ground (i.e. areas of good ground water recharge) and eventually reach an aquifer with good bearing capacity. This is a function of soils, fractures in the rock, and type of land cover, among other factors. The best aquifer recharge areas occur where areas of good ground water recharge overlap higher ranking aquifers (Maps 16, 17 and 20). None of Hunterdon County's are very high ranking aquifers from a statewide perspective. The better aquifer recharge areas within the County are located principally in areas of carbonate rock along the Musconetcong River, near Round Valley Reservoir in Clinton Township, and in Union Township. Other notable aquifer recharge areas include Brunswick shale in portions of Union and Tewksbury Townships. Most of the County's prime ground water and the best of the aquifer recharge areas are located in the Highlands.

Hunterdon County also exhibits areas of good ground water recharge but poor aquifer recharge. In these instances, there may be impermeable clay layers, glacial deposits, lack of fractures or other factors that prevent ground water from percolating all the way down to the underlying aquifer. Examples include the Sourland Mountain and many places in the Highlands region. This water enters the soils, but unable to migrate below that, ends up flowing underground, parallel to the ground surface, eventually intersecting with wetlands, streams or other surface waters. This is called "interflow."



Map 16. Ground Water Recharge Areas in Inches per Year.

Primary data source: NJ Geological Survey (NJGS).

It is important to note that the state-generated map of aquifer yields was based on statewide data from select high capacity, non-domestic wells. Municipal studies may generate differing results. For example, state mapping of aquifers in the non-carbonate rock areas of Lebanon Township indicates an average yield of 26 to 100 gallons per minute. However, recent hydrogeological studies of Lebanon Township revealed an average of 14 gallons per minute. The average is slightly less in Union and Bethlehem Townships and probably a little higher in Tewksbury Township.

Changes in Ground Water Recharge Patterns

The NJ Water Supply Authority analyzed changes in ground water recharge within the Raritan Basin between 1986 and 1995. Of the communities in Hunterdon County falling within the Raritan Basin, all experienced a loss in recharge quantities. The greatest losses in recharge (5-10%) occurred in portions of the South Branch watershed, from Three Bridges to Spruce Run, especially in Union and Clinton Townships as well as the Lamington River watershed in Clinton and Readington Townships and Lebanon Borough. The NJWSA attributes recharge reductions to the heavy conversion of farmland and forestlands to residential and commercial uses.

Ground Water Quality

Ground water quality can be affected by a variety of nonpoint source pollutants. According to the Hunterdon County Health Department, contamination usually results from volatile organic compounds released from industrial uses, from underground storage tanks and from areas used as automotive repair sites over the course of many years. Septic systems can also present problems if they are improperly sited or maintained, if homeowners dispose of hazardous materials that cannot be treated by a septic system, or if densities are too high.

County Profile—Natural Resources

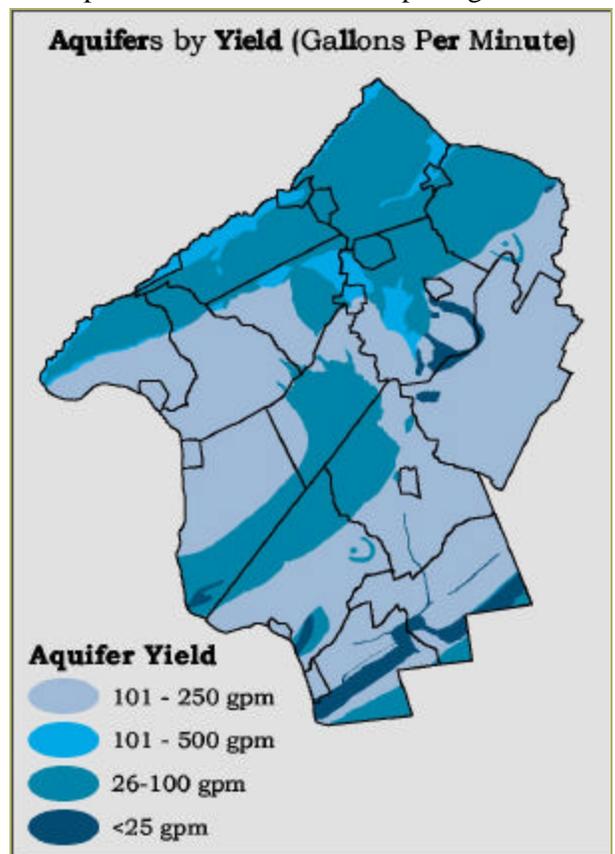
Ground water contamination can occur anywhere and at any depth. However, well water contamination is more likely to occur where wells tap large open fractures. These fractures are open conduits with little filtration capacity. Ground water travels long distances through fractures before contaminants are either degraded, diluted or removed by natural processes. This situation is typical in wells tapping carbonate rocks, among other bedrock formations.

Much like its surface water quality permitting program, NJDEP regulates discharges to ground water in order to protect ground water quality. It does so by establishing constituent standards for various groundwater pollutants. Not only must discharges meet ground water quality standards, but they also must achieve compliance with surface water quality standards if they subsequently empty into surface waters.

NJDEP regulations classify ground water according to physical characteristics and designated use(s) that must be protected. The regulations establish three major classes of ground water, two of which apply to Hunterdon County. Class I-A resources are Exceptional Ecological Areas. In Hunterdon County, examples of Class I-A ground water resources includes the Ken Lockwood Gorge, a state Natural Area in Lebanon Township. NJDEP does not approve any discharge which causes degradation to the natural water quality. Degradation limits are imposed for Class II waters, though they are not as stringent as Class I-A waters.

At the local level, municipal health boards contract the County Health Department to enforce municipal regulations by issuing permits for new private wells. Once wells are approved, boards of health generally do not deal with wells unless a problem arises. Standard well tests address no more than five parameters, none of which include volatile organic compounds. Only one municipality requires a VOC test for new wells. However, new state regulations, which recently went into effect, require testing for VOCs, heavy metals and pesticides. These tests will be mandatory for all real estate transactions, including existing and new wells.

The County Health Department, under contract with NJDEP, also conducts periodic compliance inspections of public non-community wells. These are wells serving more than 25 individuals or 15 connections more than 60 days a year other than residential supplies. They include schools, businesses, restaurants, municipal buildings and other institutions. Monitoring helps to identify contamination problems that arise, but is not necessarily a preventive planning tool to protect aquifers from contamination.



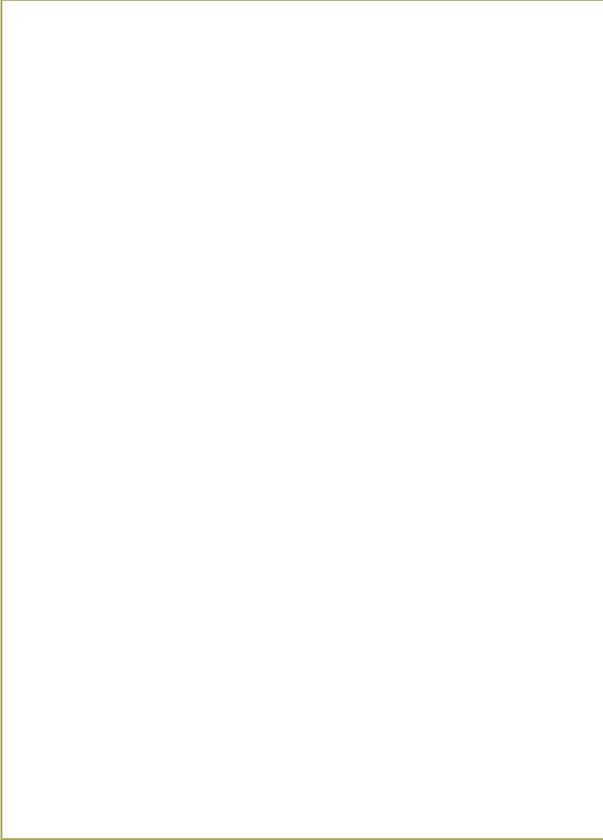
Map 17. Aquifers by Average Yield.

Derived by NJDEP using statewide data from 8,000 non-domestic wells. Primary data source: NJGS

County Profile—Natural Resources

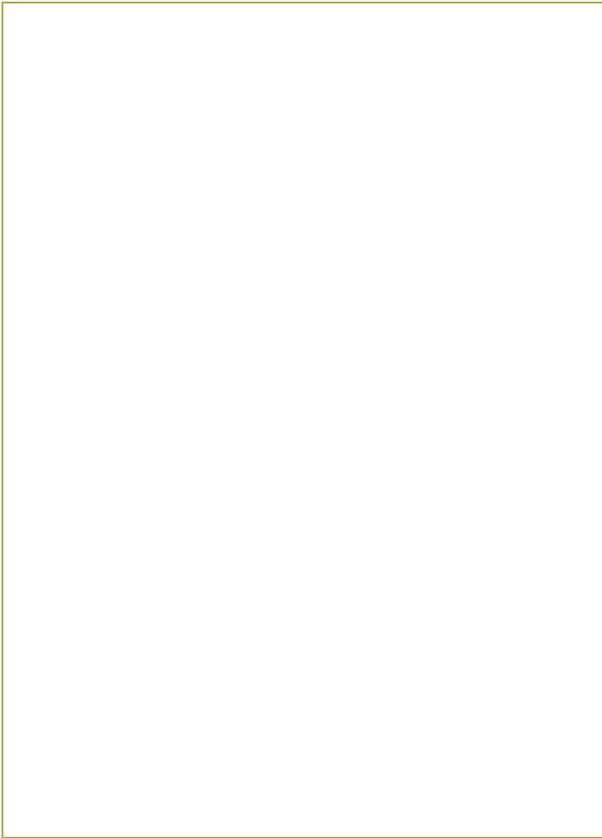
Looking at Ground Water Limitations Based on Nitrate Contamination

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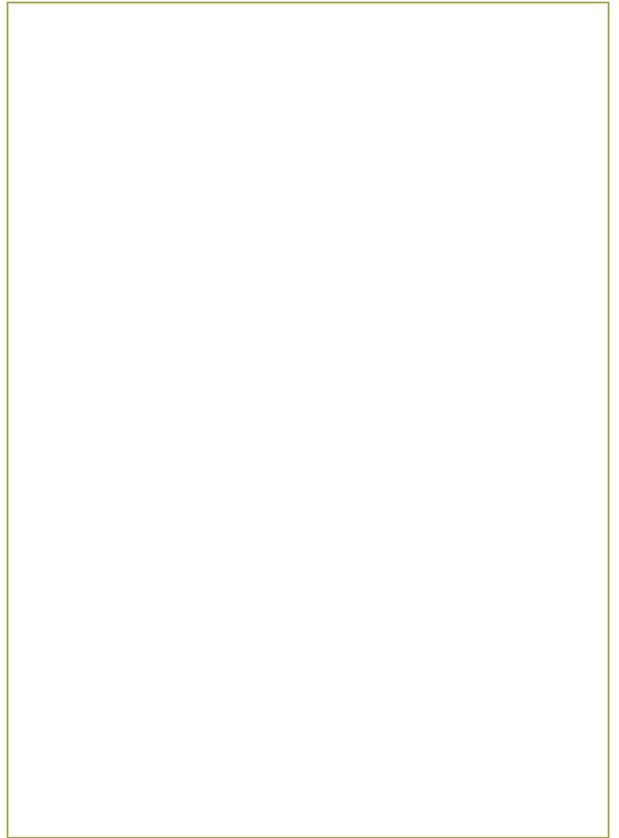


Map ____. Nitrate Dilution—Scenario I.

County Profile—Natural Resources



Map _____. Nitrate Dilution—Scenario II.



Map _____. Nitrate Dilution—Scenario III.