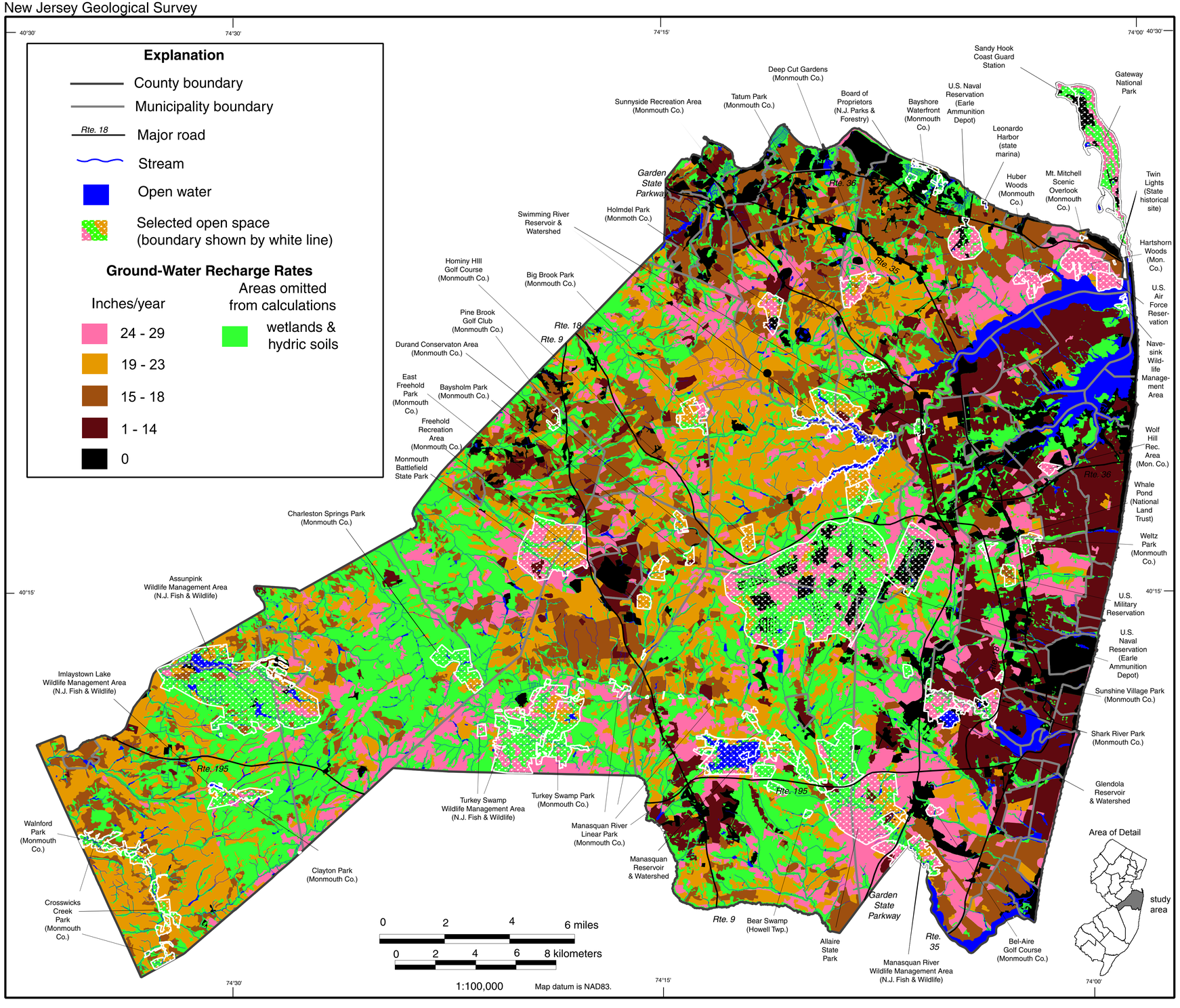
New Jersey Department of Environmental Protection
Division of Science, Research & Technology
New Jersey Geological Survey

Ground-Water-Recharge Rates and Selected Publicly-Owned Land in Monmouth County, New Jersey

Open-File Map OFM-33



ABSTRACT

Ground-water recharge in Monmouth County, New Jersey, was calculated using a method developed by the New Jersey Geological Survey. This method is based on soil unit, land use, climate, and evapotranspiration. The results are applicable to land parcels as small as 5 acres. In the study area annual recharge rates range from 0 to 29 inches/year. A value of 0 applies to impervious areas. The highest rates are associated with sandy soils in undeveloped areas throughout the county. Recharge is not assigned to wetlands, hydric soils and surface-water bodies.

The map also shows selected land owned by the Federal, State, County and local governments. Selected minor parcels of privately owned dedicated open-space is also included. The purpose of this map is to show the extent to which land areas contribute to ground-water recharge and their relationship to those areas set aside as open space or in public ownership.

INTRODUCTION

The New Jersey Department of Environmental Protection has a goal of protecting 1 million additional acres of open space by the year 2008 (New Jersey Department of Environmental Protection, 1999). Ground-water recharge is one factor which can be used to evaluate land purchases for open-space preservation. Land-use changes which reduce recharge (such as increasing the extend of paved surfaces) decrease the volume of water available to nearby water-supply wells and may decrease base flow in nearby streams. Preservation of open space can help prevent these reductions. The purpose of this map is to show the extent to which land areas contribute to ground-water recharge and their relationship to those areas set aside as open space or in public ownership.

METHOD OF INVESTIGATION

Ground-water recharge shown on the map ranges from 0 to 29 inches/year. This calcuation is based on a method developed by Charles and others (1993). The method uses soil unit, land use/land cover and climate. The results are applicable to land parcels as small as five acres because that is the limit of resolution of the underlying data. Recharge is omitted for wetlands, hydric soils and surface-water bodies. French (1996) gives a more detailed description of how this method applies to New Jersey.

This map was created using a geographical information system (GIS). A digital copy of the recharge coverage is available from the N.J. Geological Survey in Trenton.

As originally developed the method recommended a basin-calibration factor of 1.3 (Charles and others, 1993). Further investigation has shown that a basin calibration factor of 1.0 results in a net ground-water-recharge volume that more accurately matches stream base flow (Hoffman, 1999). The recharge map at left uses this lower basin-calibration factor.

MAP LIMITATIONS

This map is based on several assumptions which impose some limitations on the results. A brief description of the major ones follows.

The underlying ground-water recharge methodology relies on a number of assumptions. See Charles and others (1993) for a thorough description of these and the resulting limitations.

For this analysis all recharge rates were rounded to the nearest inch. Thus recharge rates are displayed on the map as whole numbers.

Ground-water recharge to and from surface-water bodies, wetlands, and hydric soils cannot be determined using the method because these areas may be discharge or recharge areas, or neither. Site-specific studies are needed to determine the recharge potential of these areas.

This map does not show land owned by the counties or municipalities because a GIS coverage was unavailable. Open space is from an internal GIS coverage developed by the New Jersey Department of Environmental Protection, Office of Green Acres.

The map shows ground-water recharge. This is water which has migrated downward to below the root zone. Recharged water may enter an underlying aquifer or discharge to nearby surface water. The map does not indicate the distribution, thickness or productivity of aquifers. Aquifer distribution is shown on Herman and others, 1998. French (1996) shows in detail how to produce a map of aquifer recharge potential.

DIGITAL DATA SOURCES

The map was created by referencing a variety of digital data sources. Political boundaries, streams and surface water are from publicly available data sets that can be downloaded from the DEP's web page. The reservoirs are from a 1980's coverage prepared by the NJDEP's Green Acres program. State-, federal-, and county-owned land are from coverages prepared in 1999 by the NJDEP's Green Acres program. Publicaly-owned land not shown on these covarges are not shown on this map. The ground-water recharge calculation is based on a soils coverage (from a National Resource Conservation Service) and a coverage of land use in 1991 supplied to the NJDEP by the Monmouth County Planning Board.

REFERENCES

Charles, E.G., Behroozi, Cyrus, Schooley, Jack and Hoffman, J.L., 1993, A method for evaluating ground-water-recharge areas in New Jersey: N.J. Geological Survey Report GSR-32, 95p.

French, M.A., 1996, Ground-water recharge and aquifer recharge potential for Middlesex County, New Jersey: N.J. Geological Survey Open-File Map OFM 21, 1 sheet, scale 1:100,000.

Herman, G.C., Canace, R.J., Stanford, S.D., Pristas, R.S., Sugarman, P.J., French, M.A., Hoffman, J.L., Serfes, M.S., and Mennel, W.J., 1998, Aquifers of New Jersey, N.J. Geological Survey Open-File Map OFM 24, Scale 1 to 500,000, 1 plate.

Hoffman, J.L, 1999, Basin factor calibration for ground-water recharge estimation: N.J. Geological Survey Technical Memorandum TM99-1, 2 p.

New Jersey Department of Environmental Protection, 1999, NJDEP Stragetic Plan 1998-2001: Office of the Commissioner, Trenton, 36p.

GLOSSARY

Aquifer - a geologic formation, part of a formation or group of formations that can supply usable quantities of water to wells.
Geographic Information System (GIS) - a computer-based, integrated spatial and tabular data base used for spatial analysis, data storage and query, and computer-assisted mapping.
Evapotranspiration - loss of water from a land area through transpiration from plants and evaporation from the soil.
Ground water - the part of the subsurface water that is in the saturated zone.
Ground-water recharge - the process of addition of water to the saturated zone.
Hydric soils - a soil which developed under primarily wet conditions.
Land use/land cover - a description of what is at the land surface.
Open space - undeveloped or protected land.
Root zone - the zone from the land surface to the maximum depth penetrated by plant roots.
Watershed - the tract of land that gathers water originating as precipitation and contributes it to a particular stream channel or system of channels.
Wetland - areas with a high water table and/or marked by a distinct plant population.

The New Jersey Geologial Survey is at PO Box 427, Trenton, NJ, 08625 or http://www.state.nj.us/dep/njgs/

Public data sets can be downloaded from the NJDEP's GIS website at http://www.state.nj.us/dep/gis/

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by
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